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Fig. 13.

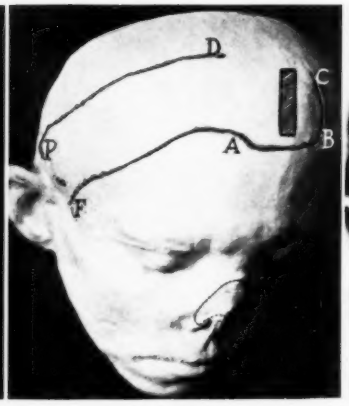

Fig. 14.

Fig. 15.

Fig. 13. Case 4. Full lateral view, showing flattening of nose, due to absence of cartilages with the elevation of tip. Implanted cartilage seen in the hair line.

Fig. 14. Case 4. Plaster cast of face and nose before operation with outlining of flap before operation. *a b c d*, The portion to form new nose; *f a d p*, the tubed, temporal pedicle; *d c*, the hinge upon which the flap was lifted up with the pericranium attached, under which Thiersch grafts were placed. In the center of *a b c d*, is seen the implanted cartilage. Below on nose is seen the area denuded.

Fig. 15. Case 4. Showing the implanted cartilage with tubing of the pedicle to right. To the left, lower part of nasal portion of flap lifted up, being hinged above, Thiersch skin grafts being placed under the pericranium and the flap replaced. Cellosilk is between the skin grafts and bone, projecting below.

Fig. 16.

Fig. 17.

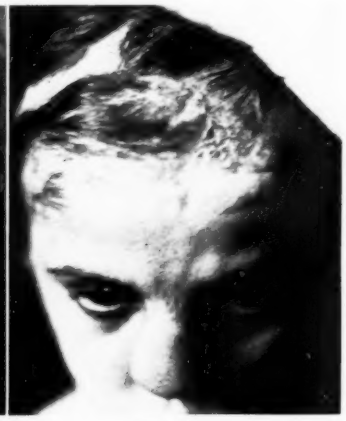

Fig. 18.

Fig. 16. Case 4. Result 2 weeks after the flap was transplanted from forehead into nose with a right, tubed, temporal pedicle. The forehead defect was left to granulate. Notice that almost the entire lower forehead is free from future scarring. The furrow to right of nose in flap is caused by jaws of a periodically compressing forceps.

Fig. 17. Case 4. Taken 4 weeks after final operation. Full face. Hair covers entire forehead scar. Excellent cosmetic result.

Fig. 18. Case 4. Shows portion, after replacing flap which required Thiersch skin grafting. Scar of this high forehead flap will be entirely hidden by the hair.

Rhinoplasty and Cheek, Chin and Lip Plastics with Tubed, Temporal-Pedicled, Forehead Flaps.—Clarence A. McWilliams and Henry S. Dunning.

SURGERY, GYNECOLOGY AND OBSTETRICS

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RHINOPLASTY AND CHEEK, CHIN, AND LIP PLASTICS WITH TUBED, TEMPORAL-PEDICLED, FOREHEAD FLAPS[1]

BY CLARENCE A. McWILLIAMS, M.D., F.A.C.S., AND HENRY S. DUNNING, M.D., NEW YORK CITY

DEFORMITIES of the nose are common, and, for their correction, a special technique has been devised which will depend exactly on the extent and character of the tissues to be supplied. Thus, we may divide them into:

1. Minor deformities of the nose which require no additional supporting structures to be supplied, as, (a) large hooked, humped, angular or beaked; (b) long; (c) laterally defected, bent or twisted; (d) snub; (e) bulbous, tuberous and rhinophyma; (f) wide-nostriled. Procedures to correct these deformities will not be considered in this paper.

2. Major deformities which require additional structures to be supplied, such as cartilage and skin, thus, (a) depressed, or saddle nose; (b) partial loss of skin or cartilage, or complete loss of whole nose. These major deformities alone will be considered in this paper.

SADDLE NOSE

Saddle nose is a frequent and very disfiguring nasal deformity, for which the transplantation of some supporting structure is necessary. There is nothing to equal transplanted cartilage for cosmetic purposes. Tieck, with some others, asserts that transplanted cartilage becomes absorbed, others maintain the contrary. Gillies has had persistence for 3 years, and he says that the cartilage remains permanently of the same shape and size as it was when imbedded, with the exception that, if one perichondrial surface only is left, the graft tends to bend, the perichondrium occupying the concavity; and this property of cartilage is utilized by the surgeon to obtain a curve in such positions as the eyelids or the mandible. The clinical evidence of the permanence of cartilage is borne out by the experimental work of John Staige Davis[2] and by the histological work of Keith and Murray. Cartilage can easily be obtained from the seventh and eighth ribs, being readily cut with a knife and shaped accordingly. Any excess of cartilage is inserted under the skin of the upper abdomen or chest as a store for use in future operations, the pain of a further rib excision being thus avoided. If, before implantation, an incision is made transversely across the cartilage (Fig. 2, *a*) but not entirely through it, three-quarters of an inch above its lower extremity, the inferior portion, at the incision, can be bent so as to lie anteroposteriorly to form a cartilaginous support for the columella (Fig. 3). Our experience with transplanted cartilage in three cases, that we have followed, is this: One patient (Case 3, Figs. 10 and 11) has now gone 7 years, and two others, 2 years (Cases 1 and 2, Figs. 5 to 9, inclusive), since the operations. In the 7-year case, the cartilage has persisted as evidenced by X-ray and palpation so that the nose is as shapely as ever. In the two boys, 2 years after opera-

[2] Ann. Surg., 1917, xlvi, 88.

[1] Read before the American Surgical Association, May 1, 1922.

tions, the cartilages are felt by palpation to have likewise persisted though they do not appear in the X-ray pictures, so that the reputed objection to implanting cartilage, because it will disappear, is not valid. Ivy, Berne, and Ferris Smith likewise maintain that cartilage will not be absorbed. It would seem to us that the reason why some maintain that the cartilage has disappeared is because they have not obtained a shadow of the cartilage in the subsequent X-rays. We have examined the X-rays of normal noses taken for other purposes, and have found that cartilage usually does not appear in the X-rays, particularly if the subjects be young. In normal adults, the cartilage *may* show if it has become calcified. In most cases it does not show. A picture of one of the authors' noses taken for the purpose of seeing whether the cartilage would show, elicits the fact that it does not appear in the X-ray.

Figure 1 shows the incisions practiced for inserting cartilage into a saddle nose. The authors have used incision *a* for the simple insertion of a strip of cartilage for saddle nose where support for the columella is not to be supplied. This incision, in a year's time, is scarcely visible. It comes under the cross bar of a pair of spectacles. Incision *a* is preferred because of the danger of infection with incision *d*.

Figures 2 and 3 give the technique of inserting cartilage when support for the columella must also be supplied. Infection is not serious in cases of cartilage implants, as is shown in Cases 1 and 2, in both of which infection occurred without subsequent injury to the cartilages. Figure 4 shows the various methods of inserting the cartilages, depending upon the amount of support necessary.

ILLUSTRATIVE CASES

CASE 1. Figs. 5, 6 and 7. (C. A. McW.) Lad, age 15, affected with saddle nose, the result of congenital syphilis. All the cartilages of the nose were gone, producing a marked depression in center of nose with broadening, causing an unsightly deformity. Wassermann negative. Operation, February 26, 1920: Transplantation of rib cartilage with perichondrium on outer surface, through a transverse incision at situation of cross bar of spectacles. Slight infection of nasal wound resulted, coincident with the development of an ischiorectal abscess. One month later, a few drops of pus could be expressed from nasal wound, but the infection had no deleterious effect on the cartilage. Now, after 2 years, the cosmetic effect is most excellent. The nose has preserved the good appearance that it had immediately after the operation. The scar can scarcely be deciphered, and the cartilage can be felt distinctly in its original size, shape, and position, though it does not become visible in the X-ray.

CASE 2. Figs. 8 and 9. (C. A. McW.) Lad, age 10, a brother of Case 1, affected likewise with congenital syphilis (Wassermann now negative), producing a more severe deformity of nose, all the cartilages and septum being gone. There was nasal obstruction and the lad was a mouth breather, because of the falling in of the alæ. The lowest inch of the nose was depressed toward the upper lip and the alæ were internally displaced. Operation, February 27, 1920: Transplantation of rib cartilage vertically through a transverse nasofrontal incision as in Case 1. There was infection of the wound. which had no subsequent injurious influence on the cartilage. Examination now, 2 years later, shows the nasal cosmetic improvement is as marked as just after the operation and the cartilage can be felt *in situ*, though it does not appear in the X-rays.

I have endeavored to have the lad allow me to perform a plastic on the right ala to lengthen it to correspond with the left ala, but he has, so far, refused. He has not arrived at the age where vanity would cause him to have it done.

CASE 3. Figs. 10 and 11. (C. A. McW.) An adult man, age 24, when 15 years of age, was struck on the nose by the hoof of a horse, producing a marked saddle nose with depression of the nasal bones with consequent marked widening of the nose. Operation, April 20, 1915: Transplantation of rib cartilage through a transverse nasofrontal incision, as in Cases 1 and 2. This patient was reported in the *Annals of Surgery*, 1917, lxv, 789. Primary union. Now, 7 years later, the nose is as shapely as could be desired and the cartilage can be felt *in situ* intact, and it appears calcified in the X-ray.

PARTIAL AND COMPLETE RHINOPLASTY METHODS OF PROCEDURE

1. The French method in which pedunculated flaps are taken from the cheeks to fill the defect. The disadvantage of this operation lies in the subsequent scarring of the cheeks. Nélaton's operation is depicted in Binnie, page 190.

2. The Indian method. In this operation a pedunculated flap is taken from the forehead and sutured to the nasal defect. The usual situation for the pedicle is between the eyebrows, requiring a twist, ordinarily leaving a hideous scar in the most prominent part of the forehead. Figure 12 shows the scar which must

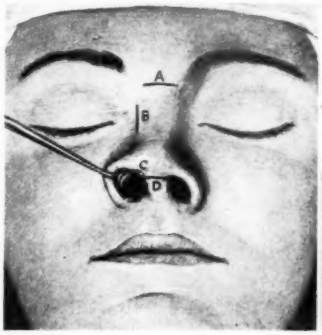

Fig. 1.

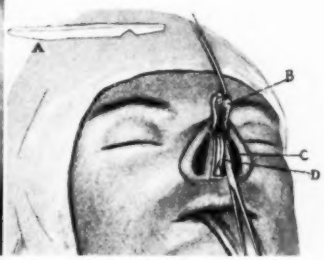

Fig. 2.

Fig. 3.

Fig. 1. Incisions (Sheehan) used for insertion of cartilage into saddle nose; *a*, infraglabellar incision preferred by the authors; *b*, inner canthus incision; *c*, ala incision for insertion of cartilage laterally; *d*, horizontal tip end incision, not the incision of choice because of the danger of infection.

Fig. 2. Method of procedure when support for the columella is to be supplied. *a*, the cartilage graft with triangular piece excised for the purpose of angulating it, the perichondrium being intact over the excised triangle to act as a hinge when bending the cartilage to a right angle, as in Figure 3. *b*, Columella hooked upward, hinged above; *c*, denuded septal membrane; *d*, cartilage of the septum, which is usually gone when this procedure is necessary (Sheehan).

Fig. 3. *a*, The graft inserted in its bed; *b*, the cartilage bent to a right angle to be covered by the columella (Sheehan).

result from such an operation. It was taken from Gillies' book, page 297. The authors maintain that for most plastics, of a severe type, on the face, including those of the nose, cheeks, chin, and lips, the high, temporal-pedicled, forehead flap, taken *within* the hair line, is by far the best because it leaves a most inconspicuous scar. The previous objection to it has been the presence of hair on the flap. Now we know that the hair can be permanently removed by the X-rays, as is seen in Case 5. After one or two applications, the hair will fall out in 1 month but will grow again. Then once a month, for 6 months, an application of the X-rays will permanently remove the hair.

Dufourmentel, in 1918, and Sebileau, in 1920, have taken hairy, temporal, forehead flaps to make up the losses of substance of the face. They can be employed to replace the upper lip, the lower lip, the chin, and the cheek, and above all, the region of the buccal commissure which is so difficult to reconstruct. It can also be made to repair the nose. It is much more comfortable to the patient than the Italian graft. By taking the temporal-frontal flap from each side, the two halves being left attached to each other in the median line, the whole upper or the whole lower lip can be reconstructed. In each pedicle is incorporated the superficial temporal artery, affording a very rich blood supply. By Thiersch-grafting the under surface before transplanting each flap, the surface of the flaps toward the mouth becomes covered with epidermis, which, being continually bathed with saliva, rapidly takes on the character of mucous membrane and does not contract. The flaps become soft and supple. On the fifteenth to the twentieth day, the flaps can be divided and the pedicles replaced in the forehead raw areas. The resulting defects in the forehead may be filled with Thiersch or Wolfe grafts. If support for the defect in the cartilaginous or bony structure of the nose is required, a piece or pieces of costal cartilage can be incorporated

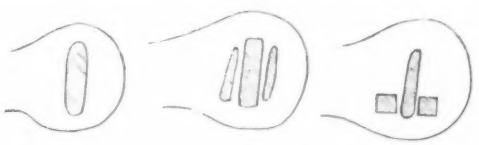

Fig. 4. Shows several methods of transplanting strips of cartilage, either directly into a saddle nose or previously implanting them into a forehead flap before transposing it into nose. *a*, Transplantation of a single vertical strip of costal cartilage; *b*, implanting of three vertical strips of cartilage, the two outer ones being intended for supports for the alæ; *c*, one vertical long strip with two short lateral, transverse strips, also for supports for the alæ.

Fig. 5. Fig. 6. Fig. 7.

Fig. 5. Case 1. Anteroposterior view before operation. Saddle nose, the result of congenital syphilis.

Fig. 6. Case 1. Right lateral view, 2 years after implantation of cartilage which has remained unabsorbed.

Fig. 7. Case 1. Left lateral view, 2 years after implantation of cartilage which has not been absorbed. The scar is scarcely visible.

in the forehead flap, before it is transplanted (see Figs. 4 and 14), or, if a piece of the inferior maxillary bone must be supplied, a piece of a rib, or an osteoperiosteal graft, or a bony tibial graft can be incorporated in the flap before it is transplanted. If the upper lip is to be supplied in a man, by going inside the hairy forehead, an admirable mustache can be formed.

These grafts with long, tubed, temporal pedicle render immense service in repairing losses of substance of the nose, cheeks, chin, and both lips. They should take the place of the Indian graft with a short pedicle which is often insufficient and leaves a very deforming scar (Fig. 12) and the Italian graft which is severely trying for the patient, as well as disadvantageous in transplanting skin of a different color and texture from the skin of the face. An advantage of the temporal-pedicled, forehead flap over the pure Indian forehead flap is evident when one must transplant cartilage previously in the flap, because, in the temporal flap, there is very little twisting of the flap, hence the cartilage can be more correctly placed in the flap with reference to its subsequent proper position in the nose. One may transplant a single vertical strip of cartilage, or three vertical strips, two of which go to give support laterally for the alæ, or one vertical and two lateral, small, transverse strips (see Fig. 4).

To prevent subsequent contraction of the transplanted flap, two procedures should be adopted; first, the pericranium should be left attached to the flap, and, secondly, the under surface of the pericranium should be Thiersch-grafted before it is transplanted, the pericranium being lifted up on a hinge above or below, and then replaced *in situ* after the Thiersch-grafting, where it is left for 2 weeks before the whole flap with its interposed cartilage is transplanted to its proper position in the nose. The cartilage is placed in a tunnel between the pericranium and the skin, where it is allowed to remain for 2 weeks before transplanting the whole flap, provided the result is aseptic. If forehead skin is not available, because of scarring, chest skin may be supplied by the use of Gillies' tubed, pedicle method.

Case 4. Figs. 13 to 18. (C. A. McW.) This was a girl 22 years of age, who first noticed lupus on the right cheek, 8 years ago, the size of a quarter. For 6 years she was under treatment in the Skin and Cancer Hospital, under Dr. Schuyler Clarke, of New York. The lupus had spread to the upper lip and the nose. The final result was a cure of the lupus, leaving a nose without cartilage, producing a very severe deformity. The authors feel that, in view of the present methods of improved plastic surgery, a better method of treating such a case is primarily to excise the lesions, and to do the requisite plastic operations at once. When the girl came to us, she had been apparently cured 4 years and she insisted upon operation to remove the deformity. A plaster cast (Fig. 14) was taken of the face and nose by

Fig. 8 (at left). Case 2. Saddle nose, the result of congenital syphilis.
Fig. 9. Case 2. Result 2 years after implantation of cartilage which has persisted. Most excellent cosmetic result.

Dr. V. Mitchell and on this was made a wax nose of the requisite size and shape. This new nose was an exact reproduction of the girl's sister's nose, who was 1 year younger. First operation, January 12, 1922: It was necessary to implant rib cartilage into the forehead as the first step (Fig. 13). To fix exact spot for cartilage, it was seen that the pedicle of the flap should be in front of the right ear with the superficial temporal artery in the base of the flap, and a tinfoil pattern was made of length required to cover in the new nose, large enough to go over the two sides of the nose. The requisite length of flap (Fig. 14) brought it over on the forehead about 1 inch to left of median line, its lower pole just above middle of forehead. It was planned to take about one-half the vertical diameter of flap in the hair (Fig. 15) to avoid scarring the forehead too much. Ether was given by drop method. An exact pattern of cartilage required was cut out of tinfoil. Incision was made over left, lower, costal border near sternum, and cartilage exposed. The pattern was placed on the cartilage and incisions made and a piece of cartilage with perichondrium, on outer side, was removed with the knife. The house surgeon sewed up the wound in the chest. A half-inch transverse incision was made in the forehead just where it had been previously determined that the lower end of cartilage should be situated. Tunnel made upward bluntly, superficial to pericranium, and cartilage inserted. Fine silk sutures closed the wound below. Dressing. Primary union resulted in both forehead and chest wounds.

Second operation, January 27, 1922, two weeks after first operation: Marking out and tubularization of temporal forehead flap with Thiersch-grafting of under surface of left extremity of flap. Intrapharyngeal ether. Measurements were taken, on the wax model of the new nose, of the distance required from left edge of implanted cartilage to the edge of the left ala. This was made one-quarter inch larger than necessary to allow for possible shrinkage subsequently, but this precaution was afterward seen to be unnecessary. Then this pattern, made of cellosilk, boiled, was laid on the forehead just to left edge of previously implanted cartilage and an exact flap edge was outlined, vertically, going through pericranium. This was turned transversely one-quarter inch below lower end of cartilage and was continued to a corresponding distance to right of cartilage. Then the incision curved up to hair line and then down in front of right ear. Several large spurters had to be tied. The pericranium was vertically divided at the extreme right edge of flap and was reflected up and left attached to under part of flap containing the cartilage. To the right, the flap was separated, superficially to the pericranium, from the bone, and the divided edges of flap were curled internally on themselves so that their edges were in contact, thus making a tube of them, where the edges were united by fine, chromic sutures. The part of the flap containing the cartilage with its attached pericranium, hinged above, was separated from the bone beneath, from below up. Thiersch grafts were taken from the left thigh and placed upon the *under* surface of the pericranium of this hinged flap, covering in the raw surface. Two mattress silkworm-gut sutures were passed beneath the tubed pedicle between the edges of the mobilized, forehead skin so as to draw them together, in order to diminish the raw surface, and, beneath the tubed pedicle, were placed strips of perforated cellosilk. Sterile dressing applied. The thigh wound was dressed with vaseline and gauze. No portion of the grafted cartilage was laid bare at any stage of the operation. Most of the flap was in the hair line so the hair on the transposed flap will

Fig. 10 (at left). Case 3. Lateral view of traumatic saddle nose before operation.

Fig. 11. Result 7 years after transplantation of rib cartilage, instancing persistence of the transplanted cartilage.

have to be removed by the X-rays subsequently. The flap was made in the hair so as to cause as inconspicuous a scar on the forehead as possible. It will be noticed that the cartilage implant was almost directly in the median line of the forehead, consequently an inch of the soft parts, to the left of the implant, will have to be to the left of the median line, and the question was whether the blood supply of this part of the flap would be sufficient when it should be transposed into the nose. Subsequent events showed that this doubt had no basis as the blood supply of the whole flap was perfect.

Third operation, February 10, 1922, two weeks after previous operation: Transference of forehead flap with right temporal, tubed pedicle. Perfect Gwathmey colonic anæsthesia. The nose deformity was first freshened all about into healthy tissue, going down to bone, excising all scar tissues. No nasal cartilages were found. The edges of the incisions were undermined so as to make the edges as thick as possible. The two arteries in the alæ bled profusely. The vessels were clamped but not tied as an endeavor was made not to interfere with the circulation to be established in the flap. There was a perforation in the septum, one-quarter inch back. Two vertical incisions alongside the columella were made with one upper, transverse one going through the perforation, thus freeing the columella, from the raw end of which there was a small spurter, showing that its blood supply was good. A pattern had previously been cut out of cellosilk, of the size of the wax model of her sister's nose, so as to get size and shape of the left side of the desired nose. This pattern was laid on the left edge of the three-quarters previously marked out frontal flap, which, when it had been lifted up, was seen to be beautifully covered on its under surface by the Thiersch grafts which had taken *per primam in toto*. Flap cut out from forehead was left attached to its tubed pedicle to right. Such a thick forehead flap does not shrink perceptibly so that it is not necessary to cut it longer than desired. This flap edge was cut to fit the angle of the left ala. Silk sutures were passed between the ala and the flap, and interrupted sutures along the left edge and above across the root of the nose. At the junction of the columella and the flap, a notch was cut in the flap, and into this notch the upper raw surface of the columella was fitted and sutured. The suturing was continued around half the right side of the two edges of the right ala up to where the pedicle became attached. The raw surface of the right ala was sutured to the under raw surface of the flap. The final result was good. The flap did not change color after being transferred, and, as its edges bled, the circulation was assuredly sufficient. The edges of the frontal defect were undermined and brought partially together with three mattress sutures upon each of which fine rubber tubing was placed. The raw defect was covered with perforated cellosilk and a sterile dressing was applied and bandaged on. After the operation, an electric light was placed in front of the nose, attached to a cradle, to provide heat to the flap. The colonic anæsthesia was perfect, the patient was quiet with no vomiting. The operation lasted about one and one-half hours and was most satisfactory from all standpoints. The observation was confirmed that transplanted cartilage tends to bend toward the perichrondial side. It was so in this case. As soon as the flap containing the cartilage was freed the cartilage seemed to curve with lower end forward.

Fig. 12. From Gillies. Illustrating disfiguring scar which must result from this short, twisted, Indian method forehead pedicle in the most conspicuous portion of forehead.

Fig 19.

Fig. 19. Case 5. Cure of epithelioma of nose by radium but with resulting deformity. The mid-cartilage of the nose has remained intact.

Fig. 20.

Fig. 20. Case 5. Tubed, right, temporal-pedicled, forehead flap, taken within the hair line, reflected into the nose.

Fig. 21.

Fig. 21. Case 5. Side view of final result.

This, it is hoped, will counteract any tendency for the cartilage, in the nose, to bend toward the cavities. Two weeks after the flap was transplanted, a smooth stomach clamp was applied, three times a day for an hour at a time, to a quarter of the vertical diameter of the flap just to right of nose. Gradually increasing amounts of the flap were taken in by the clamp each day until the whole vertical diameter of the flap was grasped by the clamp, three days before the flap was totally divided. In Figure 16, one can see the furrow caused in the flap by the clamp. Fourth operation, March 3, 1922, three weeks after the third operation: Severing and replacement of tubed, temporal flap. Rectal anæsthesia very satisfactory. Flap divided vertically through its whole extent along margin of right ala. More profuse bleeding from the cut nasal edge than from the pedicle end. The whole extent of the flap had become attached behind to the cut ala edge. Skin of cheek along the ala edge incised and undermined along cheek. The flap was very thick, connective tissue having evidently formed in it. So the entire fatty layer was excised, extending almost to the cartilage and with it some connective tissue. All the tissue that was possible was excised. Then fine silk sutures were passed between the skin edges of ala and flap. Result was excellent.

In the meantime Dr. Dunning had proceeded with replacing the freshened forehead flap. The tubed edges were divided and all granulation tissue was removed from the whole flap. The excessive granulation tissue of the forehead defect was scraped away and its edges were undermined. The flap was stretched and sutured edge to edge in position with interrupted silkworm mattress sutures, leaving an area to the left 1.5 inches transversely, and 1 inch vertically, to be Thiersch-skin grafted. These grafts were then at once taken from the right thigh. Perforated cellosilk was placed over forehead grafted area. Sterile dressing with bandage was applied. These grafts applied directly to the bone took *per primam in toto*.

Fifth operation, March 13, 1922: Retouching of edges and reduction of both sides of cartilage. At patient's request a very satisfactory colonic anæsthesia was administered. There was a prominence just below the upper scar, due to a projection of the implanted cartilage. This was clearly evident in a roentgenogram. An incision was made through the upper part of the old scar on the right side of the nose. The skin was lifted up and the cartilage exposed. The perichondrium was stripped from it and about one-quarter inch of the cartilage was obliquely divided with a knife in a direction from below upward, and from before backward. Then some of the lateral, subcutaneous tissues were removed with knife as the flap was too thick, and a little of the edge of the skin was excised as the skin was redundant. Mattress silk sutures were inserted. Below the tip, the cartilage was exposed by one-quarter inch transverse incision, and one-sixth inch of the cartilage was removed. Two silk sutures were inserted. The columella below was too prominent so its posterior surface was denuded of tissue at its lower part and also a corresponding part of the septum. Two silk sutures were inserted between the septum and the columella, so as to bring the columella backward. The flap, corresponding to left ala, projected posteriorly over cheek, so an incision was made through the old scar and a cavity was made under the skin of cheek to bring the cheek edge out. This cavity was filled by a piece of cartilage, previously removed from the base of the cartilage. Two silk sutures closed the edges which were brought together in good approximation. Primary union resulted. The final result was excellent. The nasal passages were free and dry and healed, being lined with healthy skin. The girl was immediately placed under X-ray treatment by Dr. Samuel Stern to remove the hair from the transplanted skin of the

Fig. 22.

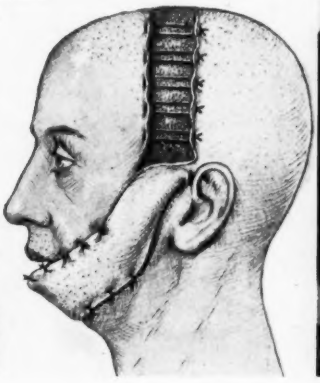

Fig. 23.

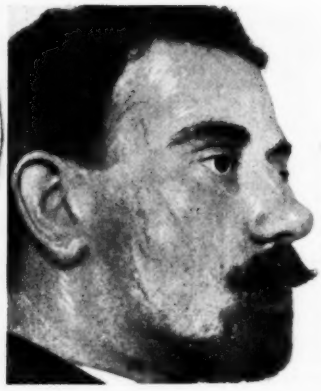

Fig. 24.

Fig. 22. Complete loss of chin, the result of gunshot wound.

Fig. 23. Method of repairing injury in Figure 22 by bilateral, attached, tubed, temporal-pedicled, forehead flaps. In this flap may be previously implanted cartilage or bone, if found necessary.

Fig. 24. Result in case shown in Figure 22 after severing and replacing the pedicles in temples.

nose. On November 1, 1922, the cosmetic result is all that could be desired. There has been no contraction of the transplant, the hair has not recurred and there are no telangiectatic changes in the skin.

A fact that this operation brought out was that with a single, temporal flap, one need have no fear of gangrene of the flap if one goes beyond the opposite, median line of the forehead, because of the extraordinarily rich blood supply provided by the contained superficial temporal artery. A second fact was that flaps made of the whole thickness of the scalp, particularly if the pericranium be included and skin-grafted on its under surface, do not shrink. A third fact was demonstrated in the very successful colonic anæsthesia administered to this patient three times. Its use should be more widely extended in operations about the neck and face. We have heard of fatalities with its use; but in the Skin and Cancer Hospital, where it has been given at least three hundred times without any disadvantageous effects, it has never caused an unquestioned accident. May not attempted modifications of Gwathmey's method be responsible for bad effects?

Case 5. Figs. 19, 20, and 21. (H. S. D.) In May, 1918, patient noticed a small pimple on the left nares, which gradually increased in size, ulcerated, and eventually involved both right and left nares. He was treated privately until about December, 1919, at which time the lesion was cauterized with electric needle and he had emanations of radium. Following this, the ulceration healed, leaving defects of both nares. Examination of pathological specimen by Dr. W. J. Clark, showed epithelioma.

At the time of admission to hospital, November 20, 1920, patient showed loss of the right and left nares to the extent of about one-half inch on each

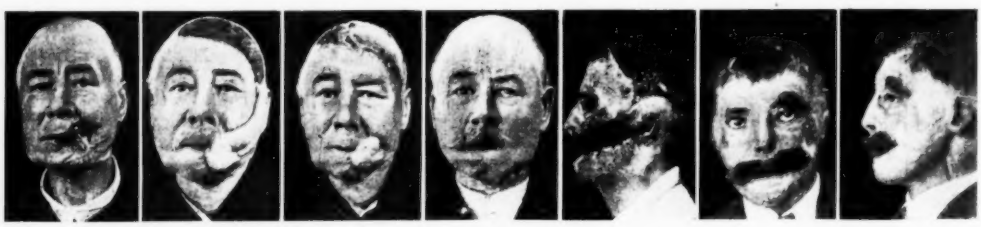

Fig. 25. First four pictures show method of repairing the difficult commissure defect. Last three pictures show method of making a new upper lip provided with a mustache.

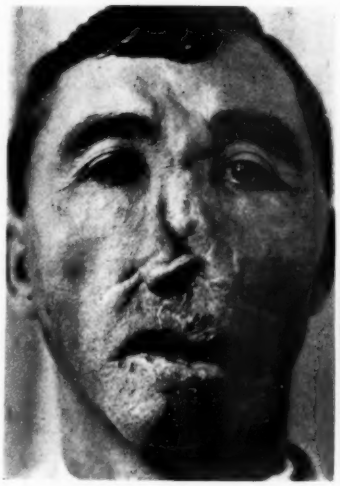

Fig. 26.

Fig. 27.

Fig. 28.

Fig. 26. Case 6. Full face showing total wiping off of face of nose with only portion of right ala left of the tip. All the structures of nose must be supplied. In this case left ring finger was used, but a much better method is to use a tubed, temporal-pedicled, forehead flap with preliminary implanting of costal cartilage.

Fig. 27. Case 6. Before operation. Traumatic wiping off face of whole nose.

Fig. 28. Case 6. Full view of new nose shortly after final operation. The cosmetic result is inferior to that which could be obtained by the then unknown temporal-pedicled, forehead flap.

side. The cartilage of the nose was present, and was covered with thick fibrous tissue. Scar tissue was present from the tip of the nose up to the juncture of the cartilaginous and bony portions of the bridge of the nose. The ala nasi were present on both sides. The mucous membrane of the nose was lost for about one-fourth inch above the lowest edge of each side of the nose.

Patient was operated on December 16, 1920, at which time tubed, temporal pedicled, forehead flap from the right side of the head in the hair line, was outlined and extended from the zygomatic arch upward to about the midline of the scalp. This was dissected free down to pericranium (but not including it) and tinfoil inserted beneath the entire surface, carrying a Thiersch graft of about 2 inches on under the surface of the flap to line the nose. The proximal half of the flap was tubed, both ends being left attached. Following this the superior end of the flap was cut in half.

January 11, 1921, a second operation was performed, the superior end of the flap being cut. Scar tissue was dissected free over the tip of the nose and the forehead flap brought down and the free end of the flap sutured along the left side of the dissected surface of the nose.

February 5, 1921, releasing of the flap on the right side of the nose and suture of the graft to the bed of the right side of the nose. The pedicle was also returned to its former bed and granulating surface on top of scalp, left to granulate.

February 10, 1921, Thiersch graft of granulating surface on top of scalp.

October 20, 1921, and November 2, 1921, minor plastic corrections along the suture line made.

In the interim between February, 1921, and October, 1921, patient had three applications of X-ray with view to destroying hair on the graft.

Fig. 29. (at left). Case 6. Finger denuded of nail was sutured into the nasal defect and held in this position for 3 weeks by a plaster helmet.

Fig. 30. Case 6. After amputation of finger at mid first phalanx. First phalanx was then turned anteroposteriorly.

Practically all hair has been removed, and the patient has not been troubled by any return of same. There is no telangiectasis in the skin.

Other plastics of face by tubed, temporal-pedicled forehead flaps. Figure 22 is a picture of a man who has lost his chin in a gunshot accident. Figure 23 shows an excellent method of repairing the defect in Figure 22, by bilateral, attached, tubed, temporal-pedicled, forehead flaps in the hair line. Figure 24 shows the result obtained after severing and replacing the pedicles in the temples. Figure 24 gives the result after the hair has grown on the transplanted chin.

Figure 25 illustrates the method used in repairing the difficult commissural defect and of forming a new upper lip with a new mustache also provided.

THE ITALIAN METHOD

In the Italian method the skin for the repair of the nasal defect is taken from the inner and anterior aspects of the arm. The objections to this are: first, that the arm must be maintained in a very trying position for 2 or 3 weeks; second, that the skin of the arm is of a different color and texture from the skin of the nose and cheek; third, that there is greater liability to infection, as the distance to be bridged and tension are greater with a poorer blood supply than with the temporal-pedicled flap, in addition to which there is greater difficulty in maintaining cleanliness under the flap, hence the greater danger of gangrene of the flap; and, fourth, the impossibility of epithelizing the under surface of the flap properly. If a flap is not provided with epithelium and is allowed to cicatrize, contraction is bound to occur, defeating the whole purpose of the operation. The Italian flap is being less and less frequently employed in face plastics and should be ordinarily replaced by the temporal-pedicled forehead flap. Where this latter method is impossible because of previous scarring, the skin of the chest should be used, following Gillies' tubed, pedicled method.

THE FINGER OPERATIVE METHOD

In the finger operative method a portion of one of the left fingers is transplanted to make up for the nasal defect. The cosmetic final results are poor. One of the authors has done one of these operations, but he will never do another by this method.[1] There are but few operators who have used the procedure a second time. Finney is the only operator we know of who has reported a second case. The tubed, temporal-pedicled forehead flap method, with or without previously implanted cartilage, is infinitely superior in its results and much easier both for the operator and for the patient. Another disadvantage of the finger operation is the consequent blocking of the air passages caused by the width of the phalanges.

Case 6. Figs. 26 to 30. (C. A. McW.) Reported in full in the *Journal of the American Medical Association*, March 8, 1913. An adult had lost his entire nose, years before, in an accident in a stationary engine. The left ring finger was used to replace the lost nose. The cosmetic result was only fair. The authors feel that a much better procedure is to make a new nose out of a temporal-pedicled forehead flap into which cartilage has previously been transplanted. This man died 2 years after transplantation, of pneumonia.

For the excellent photographs, we are indebted to Mr. C. J. Lander, of the Presbyterian Hospital, New York.

[1] J. Am. M. Ass., 1913, March 8.

PARATHYROID HYPERPLASIA AND BONE DESTRUCTION IN GENERALIZED CARCINOMATOSIS[1]

By PAUL KLEMPERER, M.D., Chicago

THE function of the ductless glands and their relation to various diseases form a fruitful field for investigation in experimental medicine. Anatomical observations have often given the first suggestions to the experimental worker as to the importance of various organic changes in the pathogenesis of some of the obscure diseases, and thus it has laid the foundation for the further advance of our knowledge in this direction. However, our knowledge of the function of the ductless glands has been developed largely by means of experimental work. To morphological pathology, however, another problem has been left: This is to corroborate our knowledge of the function of the ductless glands, founded by experiments on animals, through the postmortem findings in the human body. Efforts in this direction are partly retarded by the deficiency of our knowledge of the finest morphological changes with which changed organic functions may be associated; partly, however, more external causes are to blame, namely, the relatively small number of cases which come to the pathologist for study. From this point of view the report of the following case seems justifiable, in that it may fulfill, in a certain sense, the above mentioned claim.

The patient, a female 49 years of age, entered the hospital in September, 1920. Both mammary glands had been removed with a diagnosis of cancer, 18 months previously. Six months before entering the hospital the patient had pains in the back. These became gradually worse and she entered the hospital complaining of these pains. The patient was very anæmic and cachectic; on physical examination she complained of pain over most all body structures, especially in the spinal region. The X-ray examination showed multiple cancer metastases in the whole skeleton.

Blood findings on entering were red blood cells 2,100,000; white cells 3800; hæmoglobin 18 per cent; color index, below 1. This decreased to 1,000,000 red blood cells, hæmoglobin 14 per cent before death. In smears poikylocytosis and numerous normoblasts were present. The latter frequently showed disintegration of the nuclei and peculiar nuclear forms resembling clover leaves. The differential counts of

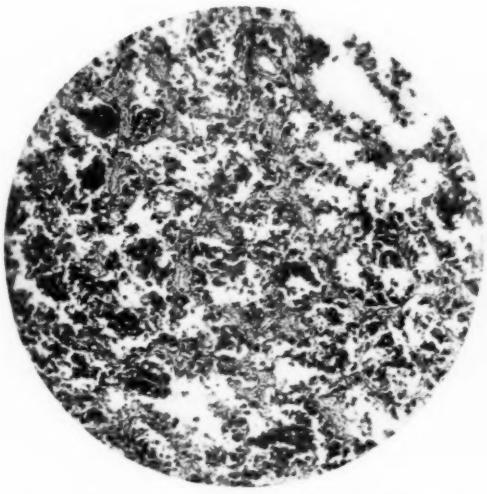

Fig. 1. Metastasis in the lung composed of irregular glandular formations and solid tumor cell nodules.

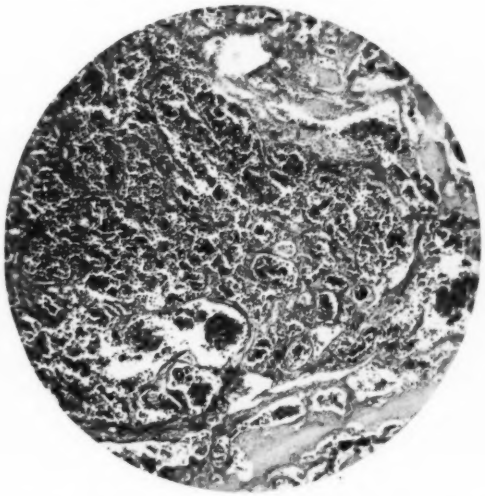

Fig. 2. Metastasis in the vertebra, almost complete destruction of bone tissue.

[1] From the Pathological Department of the Loyola University, School of Medicine.

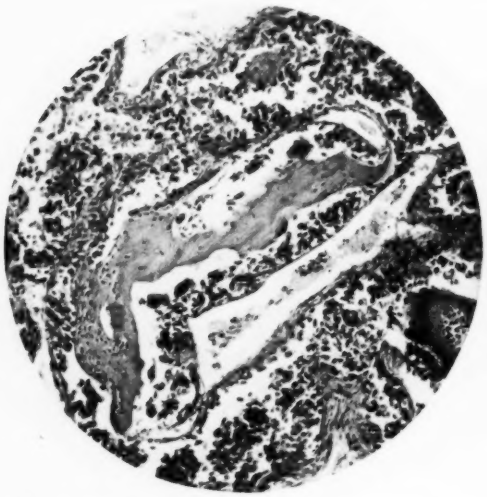

Fig. 3. A trabeculum with Howship's lacunæ and osteoclastic giant cells.

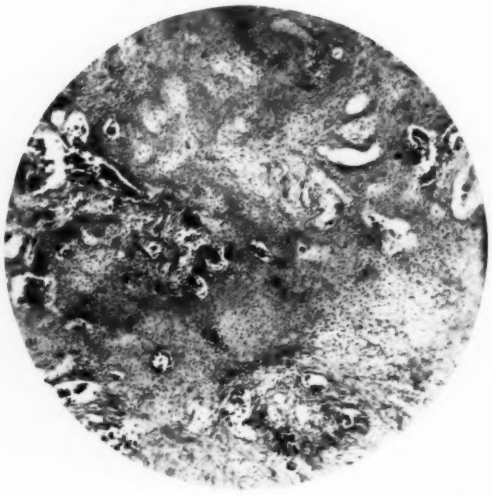

Fig. 4. New formed osteoid tissue, probably of metaplastic origin from connective tissue.

the white cells were practically within normal ratios. Only a few large mononuclear cells could be seen which were recognized as neutrophile myelocytes.

The urinary findings were negative.

With increasing cachexia the patient died after a 3 months' stay in the hospital.

At the autopsy scars were found caused by the removal of both mammary glands with a radical resection of the axial lymph glands. In both lungs numerous tumor nodes were present. The most significant condition, however, was the state of the skeleton, The spine in its whole extent could be cut easily with the cartilage knife, in the right femur, there were larger and smaller nodules narrowing the cortical substance, while they destroyed the spongy substance of the bone in the epiphysis. There were also metastases in the cranial and in the sternal bones.

The extensive destruction of bone tissue occasioned an examination of the parathyroid glands. On dissection three were found in the normal place; they seemed to be unaltered in their size. Instead of the left inferior parathyroid gland I found an oblong, kidney-shaped body 30 by 5 by 3 millimeters in size, entirely separated from the thyroid gland. It was yellow in color, and dense in consistency.

The pituitary gland was taken out as usual in every case of mammary cancer; it seemed to be of normal size and was preserved without dissection. I took parts of the lung metastases, spine, all glands of internal secretion and, of course, the tumor in the parathyroid area for further histological examination.

The histological examination of the lung metastasis revealed an adenocarcinoma of highly anaplastic structure composed partly of irregular glandular formations, partly of solid tumor cell nodules.

In sections through a vertebra we found areas with an almost complete destruction of the bone which was replaced by an extensive growth of cancer cells. On other places we could recognize the way the bone was destroyed. The destruction was brought about to the greatest extent by formation of Howship's lacunæ in which numerous giant cells were found. Here and there we saw columns of carcinoma cells invade the lacunæ but we could not find giant cells in these places. Such pictures might suggest the possibility of bone destruction by the cancer cells without osteoclasts. In other places of the slides we found, instead of the normal bone, an extensive formation of a fibrous tissue and osteoid tissue enclosing the rest of the bony trabeculæ. The development of the osteoid tissue could be observed only in a few places and seemed to be rather dependent upon a metaplastic origin from connective tissue than on osteoplastic activity.

Thus the histological picture of the bone metastases revealed not only an extensive bone destruction but also a noticeable new formation of osteoid tissue. The outstanding differences between the bone lesions in our case and the ordinary lesions in mammary and prostatic cancer, consist in the former of a complete absence of calcification of the newly-formed osteoid tissue. This appearance agrees in a certain sense with the bone condition in osteomalacia and justifies the name "osteomalacia carcinomatosa."

Fig. 5. The parathyroid hyperplasia (low power).

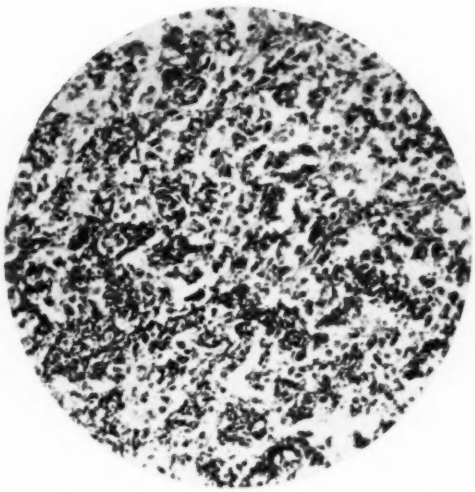

Fig. 6. Showing tumor cells among the "chief cells."

On histological examination the parathyroid glands were found to be formed mostly by cell cords; partly, however, they exhibit an alveolar structure. On further examination we found that this tissue was formed by a fine connective tissue with numerous blood vessels forming the framework for two different types of cells. The majority of the cells were of medium size with large nuclei and the cytoplasmic zone was usually narrow. Within this group small differences can be found among the cells in regard to the amount of cytoplasma and chromatin in the nuclei. Differences that are not very conspicuous do not justify a further classification. It rather seems proper to class together all these cells and to compare them with the known cells of the parathyroid glands. In this instance we are entitled to conceive these cells as the "chief cells." The other type consists of larger, sharply defined cells which differ from the above described cells by their copious, dark red stained cytoplasma and their small, very deeply blue stained nucleus. These cells lie partly between the "chief cells," partly, however, they form small alveoli containing occasionally colloid. These cells correspond to the so-called "oxyphile" or "Welsh's cells." The tumor of the left inferior parathyroid body showed in sections the same structure as the three parathyroid glands and was built up by the same cells. The structural differences within the "chief cells" were also present. The eosinophile cells were collected in large groups. In two areas we found small tumor cell nodules, one focus located just in a group of eosinophile cells.

Since the tumor was unquestionably formed by parathyroid cells the question arose as to whether this formation was a real parathyroid-tumor or merely a hyperplasia. From a histological standpoint it seems justifiable to conceive it as a real hyperplasia, since it is composed equally of both kinds of the cells of parathyroid glands, yet not exhibiting an overgrowth of any one type of the cells. Maresch (1) gives a description of tumor-like hypertrophia of parathyroid glands which fully corresponds to our findings. He points out that the characteristic histological picture of hyperplastic parathyroid gland is "an increase in the size of the chief cells and their nuclei, various degrees of compactness of their cytoplasma, alveolar formation with a colloid-like content, extraordinarily large accumulations of large and small eosinophile cells."

Serial sections through the pituitary gland revealed that the posterior lobe and the intermedial zone were almost fully destroyed and replaced by tumor growth, whereas the anterior lobe was not involved, and its cellular structure seemed entirely normal.

Tumor metastases were found in the thyroid gland and in the left ovary. The pancreas and adrenal organs were free from metastases and showed a normal appearance.

Discussing these histological findings, we wish to call attention at first very briefly to the fact that a complete destruction of the posterior lobe of the pituitary gland did not lead to any changes in the amount of the urinary secretion. This fact seems to justify the statement established by Leschke (2) and accepted later by the majority of the physiologists that the posterior lobe of the pituitary gland does not regulate the water excretion. In regard to the statement that a nerve center

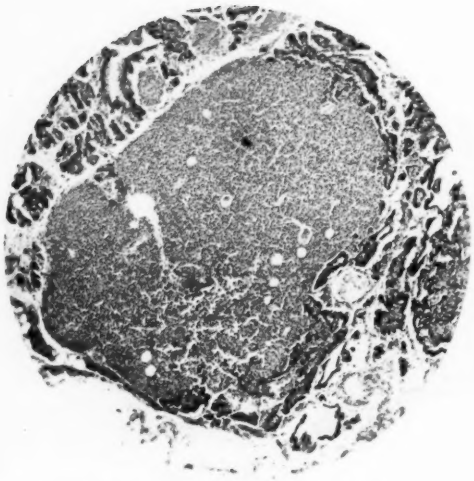

Fig. 7. A group of eosinophile cells.

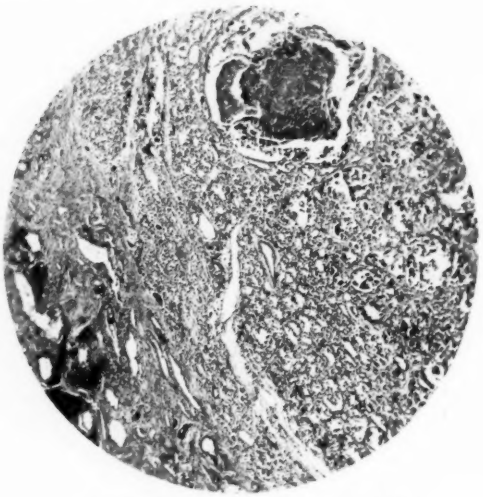

Fig. 9. Thyroid gland with metastasis.

in the floor of the third ventricle is responsible for this regulation, we may mention that the anatomical examination did not reveal any changes in this region in the case here described.

Fig. 8. Pituitary gland. The posterior lobe destroyed by tumor masses.

The most interesting question, however, is the relation between the extensive bone destruction and the parathyroid hyperplasia. Briefly reviewing the literature, we mention the first paper by Erdheim (3) who found hyperplasia of the parathyroid glands in 6 cases of osteomalacia. These findings were confirmed in the next few years by Strada (4), Bauer (5), Schmorl-Todyo (6) and others. These observations were extended by Maresch (1), Meyer (7) and Hartwich (8) to other conditions of bone destruction, such as osteitis fibrosa and osteoporosis. The extensive bone destruction, however, in bone carcinomatosis has not heretofore been considered and our case is the first in which an examination of the parathyroid glands has been made.

In a discussion of an enlargement of the parathyroid bodies we have to consider, as Maresch pointed out, whether the overgrowth represents a real tumor or a tumor-like hyperplasia. In the latter instance we would expect bony changes, but not in the former. The enlargement in this case proved histologically to be a real hyperplasia because of its complete resemblance to the three parathyroid glands in its structure. One is therefore entitled, I presume, to bring it in rela-

tion to the bone destruction. The question whether hyperplasia of the parathyroid glands is to be considered as the cause or as the result of the disturbance of the calcium metabolism, cannot be answered definitely.

The majority of writers, however, favor the latter conception that the hyperplasia of the parathyroid glands is to be interpreted as an increased functional activity tending to compensate for a disturbed calcium metabolism. In our case there is no doubt that the bone destruction is due to the carcinomatosis and this fact could better support the above-mentioned assumption than any other observation. The question, however, remains why the calcification of the newly-formed osteoid tissue failed to appear. If the extensive bone destruction with the extreme deprivation of calcium called for a compensatory hyperfunction of the parathyroid glands and if this hyperplasia really means hyperfunction, it seems remarkable that one does not find any trace of calcium deposition in the newly-formed osteoid tissue. Such a consideration induces the conception that the hyperplasia of the parathyroid glands is by no means synonymous with a hyperfunction. I would rather consider it as a fruitless attempt of the body to compensate for the calcium deficiency and conceive the hyperplasia as the structure of a hypofunctioning gland. The characteristic picture of a hyperactive parathyroid gland is not known as yet. Tomaszewski (9) attempted to find noticeable changes in the parathyroid glands in instances of larger calcium deposition in the body. He claimed an increase of the eosinophile cells and a formation of follicles with colloid as a sign of an increased function. Considering, however, that a calcium deposition as in calcified ribs, atherosclerosis, or calcified tuberculosis is not to be considered as a very extensive one, I doubt whether his conclusions can be applied to this case. Perhaps one would recognize the feature of a hyperactive parathyroid gland if he examined the glands in cases of prostatic or mammary cancer with extensive osteoplastic metastases, a condition which is combined with an entirely changed calcium metabolism, involving both destruction and an accumulation to a very high degree.

The predominance of osteoplastic changes in prostatic cancer metastases and of osteoclastic changes in thyroid cancer metastases are well known facts. If the parathyroid glands were carefully examined in all cases of bone metastases, it is possible that some light might be thrown upon this obscure process.

I publish this report, conscious of its incompleteness; but because of lack of autopsy material at my disposal at the present time, I hope it will stimulate others who have better opportunities, to continue these observations.

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UNILATERAL DIURESIS[1]

By ANDREW FULLERTON, C.B., C.M.G., Belfast, Ireland

I HAVE chosen the title "Unilateral Diuresis" for this communication on account of its convenience, although it hardly covers the substance of my remarks, which will deal with differences in the specific gravity of the urine on the two sides in certain surgical affections of the kidney. In some renal disorders there is what I may term an active or acute diuresis, or an increased activity of the normal kidney function: in others the kidney is more disabled, and its function is confined in the main to the process of filtration. This may be called passive or chronic diuresis. There is a third class, in which much destruction of kidney substance has taken place, and the urine secreted is not only diminished in specific gravity but reduced in quantity.

Cushny,[2] who is mainly responsible for what he terms the modern view, thus shortly summarizes the two rival theories of urinary secretion. Bowman's theory as elaborated by Heidenhaim regards "the glomerular capsule as normally secreting a dilute fluid not far removed from a deproteinized lymph in constitution. This fluid as it passes down the tubules carries with it the products secreted by their walls, such as urea, uric acid, and salts, and issues in the collecting tubules as the normal urine." The modern view states that "the function of the kidney may be shortly defined as the filtration of the non-colloids through the capsule and the absorption of 'Locke's fluid' through the tubule cells. The capsule furnishes the tubules with the fluid as it exists in the circulation, the tubules return to the blood the fluid best adapted for the tissues, and allow the rest to escape in the urine."

In diuresis the fluid is hurried through the tubules, and time is not allowed for taking up the products secreted by the tubules, according to the older theory, or for reabsorption of fluid, according to the modern theory. The result is a dilute urine of low specific gravity. Cushny says that the composition of this urine is that common to all forms of diuresis—more abundant chloride, less marked acidity. Further research on the chemical composition of the urine is necessary in surgical affections of the kidney. In chronic cases the percentage of chloride may be much diminished.

A good example of active or acute diuresis is that occurring in hysterical or nervous persons. A large quantity of pale, limpid urine of low specific gravity is secreted. A familiar example of passive or chronic diuresis is afforded by obstructive conditions of the urinary outlet, such as enlarged prostate. Here the quantity of urine passed in 24 hours may reach 7 to 10 pints or more, and the specific gravity may be 1005 or under.

The object of this paper is to establish the importance of diminished specific gravity of the urine on the affected side as a sign of unilateral disease of the kidney or disturbance of its function. For many years I have been interested in the specific gravity test in surgical affections of the kidney, and have made, up to the present, 448 observations. In all cases a double catheterizing cystoscope was used, and the specimens in each were taken at the same time, and as far as possible under the same conditions as regards the size and shape of the ureteral catheter and the distance along which it was passed into the ureter. All specimens taken at different times, and those which contained much blood or thick pus, were discarded. The specific gravity was taken with glass beads registering from 1005 to 1030. Obviously this is a rough and ready method, but I have found it convenient for practical purposes. In a few cases more exact methods were employed. Before taking the specimens for examination, time was allowed for the discharge of a number of jets, until it was judged that the disturbance caused by the introduction of a foreign body into the ureter had subsided. A temporary

[2] Cushny. The Secretion of Urine. London: Longmans, Green & Co., 1917.

[1] Presented before the Clinical Congress of American College of Surgeons, Boston, October 24, 1922.

anuria is frequently produced by the mere introduction of the catheter, and time must be allowed for this to pass off. On the other hand, in a nervous patient the urine first collected may be very watery and of low specific gravity, and one must wait until the patient has become calm, so that as normal a secretion as possible may be obtained. It is not uncommon to find the specific gravity increase, and the quantity emitted in a given time diminish during examination in such cases. Notwithstanding all the difficulties associated with procuring a typical specimen in a given case, care and patience will be rewarded by obtaining results of much value in diagnosis.

In order to estimate the significance of variations of the specific gravity on the two sides it is important to ascertain the conditions present in health. It is, of course, impracticable to examine perfectly healthy individuals, and fortunately, this is not necessary, as many patients suffering from obscure symptoms are glad to avail themselves of any means likely to clear up difficulties in diagnosis. I have examined 117 patients in whom all the evidence, after careful cystoscopy, was against a renal origin of their complaint. These cases appear in my notebook under such headings as "pain in the back or side," "frequency of micturition for which no cause could be discovered in the urinary system," "oxaluria," "phosphaturia," "urethral caruncle," "dysuria," "abdominal pain," "abdominal tumor," "affections of the uterus and ovary," "affections of the gall-bladder and bile ducts," "enlargements of the spleen and liver," "extra-uterine pregnancy," "colitis." "vague aches and pains," "neurasthenia," "cystitis," "ulcers and tumors of the bladder without involvement of the kidney," and in 111 out of the 117 the specific gravity was equal on the two sides. I am not certain that, after all, there may not have been some disorder of the kidney in the six exceptional cases. Two were cases of cystitis, and it is possible that a previous unilateral pyelitis had cleared up, leaving some disturbance of function on that side. In addition to these normal cases some cases of bilateral disease of the kidney were examined, with the following results. In 10 cases of nephritis without obvious hæmaturia the specific gravity was equal on the two sides. Out of 26 cases of bilateral pyelitis the specific gravity was equal on the two sides in 21. In the remaining cases my notes record that the condition as shown by the amount of pus and albumin was more severe on the side of the lower specific gravity. All this goes to prove that a difference in specific gravity on the two sides indicates some abnormal condition on one side, or, if both kidneys are diseased, an inequality in the extent of the involvement on the two sides. I have found that in the following groups (with certain exceptions) a lowered specific gravity is found on the affected side: renal calculus, tuberculosis of the kidney, tumors of the kidney, unilateral pyelitis, hydronephrosis, polycystic disease of the kidney in which one side is more involved than the other, hydatid cyst of the kidney, movable kidney, renal colic, renal infarcts, gunshot wounds of the kidney, and some cases of symptomless renal hæmaturia.

RENAL CALCULUS

Forty-eight cases were examined. Thirty-two of them were verified by operation; in 9 cases calculi were passed, and in one several small stones were discharged through a sinus in the loin. Four cases were bilateral, and in 3 the patients were examined shortly after the calculus had escaped from the ureter. This leaves 41 cases of unilateral renal calculus examined while the stones were in position. In 31, or over 75 per cent of them, the specific gravity was diminished on the affected side. In about half, the specific gravity was as low as 1005 or under on the affected side, as against 1015 to 1025 on the sound side. In 2 cases the specific gravity was a little higher on the affected side, and in the remaining 8 it was equal on the two sides. In some of these cases of renal calculus we have typical examples of what I have termed active or acute unilateral diuresis, i.e., rapid flow of urine of low specific gravity, on the affected side. The following are examples.

A man, aged 55, was examined in one of the intervals between his attacks of left-sided renal colic. The left ureter was very active and discharged watery urine, specific gravity 1005, faintly acid,

without deposit, free from pus, but containing a trace of albumin. The right ureter discharged, with less activity, urine of a deep amber color, specific gravity 1025, sharply acid, depositing urates on standing. A day or two later he passed a small calculus. Subsequent X-ray examination showed the kidneys clear.

A woman, aged 32, suffering from repeated attacks of right-sided colic, was examined during an interval. The right ureter discharged as many as 20 drops at a time through the ureteral catheter, with intervals varying from 5 to 15 seconds, and at other times only a couple of drops with each efflux. The left ureter discharged about 5 or 6 drops every 15 seconds, and was more regular in rhythm, and in the quantity emitted. The specimen from the affected side was almost colorless, neutral in reaction, specific gravity under 1005, and contained pus and albumin. That from the sound side was amber in color, acid in reaction, specific gravity 1010, and free from any abnormal constituent. The calculus was subsequently passed.

As leakage by the side of the catheter is liable to occur in all cases of ureteral catheterization, too much dependence must not be placed on the exact amount collected by this means. The following bilateral case is instructive.

A woman, aged 47, had had pain in the right loin which passed off, to be succeeded some years later by pain in the left which culminated in an agonizing attack of colic a few days before I saw her. Urine could be seen issuing from the right ureter but no flow could be detected from the left. The ureteral catheter could be passed only about 2 inches into the left ureter. (X-ray had previously shown a small shadow in this position and a definite calculus in the right renal pelvis.) Indigocarmine injected into the buttock came through in 15 minutes on the right side, but no flow could be seen on the left, not even by the side of the catheter. The tint of the specimen from the right ureter was much paler than normal and remained so until it finally disappeared 26 hours later. The pain had become fixed in the left iliac region after the last severe attack of colic. A week later a small irregular oxalate calculus was passed and all pain disappeared. Cystoscopy was carried out the same day. Indigocarmine of a deep blue color now appeared on both sides in 10 minutes. The flow from the left side was now active and the specimen collected had a specific gravity of 1010, and was free from pus and albumin. The specimen from the right ureter contained blood, pus, and albumin, and had a specific gravity of 1015. Later I removed a phosphatic calculus from the right renal pelvis, which showed signs of commencing hydronephrosis.

A study of these 3 cases is very interesting from the point of view of the physiology of anuria on the one hand, and polyuria on the other. Surgeons have long been acquainted with reflex anuria as the result of the irritation of a renal calculus. The third case mentioned above shows that anuria on the side of the calculus causing most irritation may occur. The calculus was too small to cause a complete block of the ureter, but not only was there anuria on the side of the pain, but the function of the opposite kidney was to some extent interfered with as shown by the delay in the appearance of indigocarmine and the pale color of the specimen maintained during the 26 hours of its elimination.

While much has been written on unilateral and bilateral anuria, very little has been said of the occurrence of unilateral diuresis,[1] from whatever cause produced. My own experience is that unilateral diuresis is a much more common result of renal calculus than anuria. The explanation of both phenomena is afforded by a study of the nerve supply to the kidney, and its influence on the blood flow. Through the splanchnic the kidney receives vasoconstrictor and vasodilator fibers. The stimulus of a calculus in kidney or ureter may cause vasoconstriction and reduction or cessation of the secretion of urine on that side, due to diminished blood flow through the glomeruli. On the other hand, it may cause vasodilation, increased blood flow, and diuresis. My observations lead me to believe that the latter is the more common occurrence.

Professor Cushny in a recent letter to me on this subject states: "There may be two constrictor effects, one on the afferent vessels of the glomerulus which would reduce its blood supply and lessen the filtration, another on the efferent vessels from the glomerulus which would raise the pressure in the glomerulus and thus cause diuresis." He says: "This constriction of the efferent vessels, while increasing the glomerular filtration, might very well lessen absorption in the tubules through lessening the oxygen supplied to the cells."

I have not noticed that in the form of diuresis we have been discussing there is any notable increase in the daily output of urine, although these patients often complain of frequency of micturition during the attacks

[1] Keith and Snowden. Arch. Int. Med., 1915, xv, 239–264.

of pain. An increase on one side may, therefore, be associated with a corresponding diminution on the other. Further observations on this point are necessary.

The effect of the calculus on the secretion of urine may be due to pain, but I have seen the same phenomenon when pain was entirely absent. Cushny discusses "pressure diuresis" seen in animals when one ureter is slightly obstructed, and states that it is almost certainly due to a reflex vasodilation, and disappears at once when anæsthesia is deepened. He suggests that a slight stimulus arouses a dilator effect while a stronger one, such as the pain of a calculus, sets the more powerful constrictor in action and this leads to anuria. My observations do not sustain this view. The stimulus produced by a calculus is certainly in many cases very severe, and yet diuresis is the more common effect.

There were 2 cases of renal calculus in which the specific gravity on the affected side was higher than on the sound side. In both, operation showed evidence of some obstruction. In these cases the effect of the obstruction may have been to delay the urine in the tubules, and allow of its greater concentration. Cushny, explaining the results of obstructing the ureter in animals, says that the pressure in the ureter opposes the filtration pressure in the capsule and a low resistance may reduce the amount of filtrate considerably. The smaller amount of filtrate passes more slowly along the tubules and more time is allowed for the reabsorption of water and sodium chloride. These experiments and their explanation throw much light on the findings in the cases I have mentioned, but it is difficult to see why the same cause should produce at one time reflex diuresis and at another increased concentration of the urine.

I have had the opportunity of examining at operation many kidneys in which small calculi had produced the diuresis to which I have referred. These kidneys have appeared to the naked eye sound in every respect. In addition I have had occasion to cystoscope a few patients either after the passage of a stone or after operation for its removal, and have found a rapid return to the normal. In cases of renal calculus which have lasted some time, and in which organic changes in the kidney have taken place, the specific gravity of the urine is still low. This is the more chronic or passive form of diuresis. Later the amount of urine on the affected side diminishes as the functional area of the kidney is reduced, until finally the latter becomes obsolete and no excretion whatever takes place. In such cases ropes of pus may be squeezed from the ureteric orifice. Occasionally a perirenal abscess forms and bursts, or is opened and calculi are extruded.

TUBERCULOUS KIDNEY

Forty-one cases of tuberculous kidney were examined. Three of these were bilateral and had an equal specific gravity on the two sides. One case, which was unilateral, had a low specific gravity, 1005, on both sides. In all the remaining cases the specific gravity was reduced on the affected side. This gives a percentage of 97 showing diminished specific gravity on the side affected.

The urine on the affected side is usually pale, slightly acid or neutral in reaction, increased in quantity, and contains pus and albumin. That on the sound side is generally deep amber in color, acid, and is discharged at a slower rate, at least in the early cases. A good example is the following:

A woman, aged 24, had signs of bladder irritation with pus, blood, and tubercle bacilli in the urine. The discharge from the left ureter was very free, faintly acid, and contained flecks of pus. The specific gravity was 1005. That from the right ureter was slow—a few drops at a time, strongly acid, amber in color, and deposited urates on standing. The specific gravity was 1020. The left kidney was normal in size, and presented the following appearances: The greater part of the cortex was quite normal to the naked eye. On section a few gray tubercles were found in the medullary portion skirting pelvis. At lower pole an abscess cavity the size of a small marble and lined with caseous material, was found. The ureter was not thickened.

Thus we have a strong resemblance between the effect of early tubercle and that of a small renal calculus upon the renal secretion.

The following case was more advanced.

The symptoms were similar to those in the one just described. The specimen from the left ureter was discharged in continuous drops, was acid,

watery, with a specific gravity of 1005, and contained pus, albumin, and tubercle bacilli. That from the right ureter had a specific gravity of 1020, was sharply acid and deposited urates on standing. The specimen taken from the bladder just before cystoscopy had a specific gravity of 1010. Supposing that the secretion remains the same during cystoscopy—an assumption by no means always justified—more urine from the left side must have been present to give a specific gravity of 1010 in the mixed specimen. At any rate more urine appeared to be secreted on the affected side. (I have already referred to the difficulty of estimating the quantity discharged when a catheter is in the ureter.) The kidney, which was a little enlarged, showed the following appearances: A few gray tubercles were seen at the upper pole, but not elsewhere. On section the pelvis was found to be ulcerated and studded with tubercles. The calices were hollowed out into abscess cavities lined by caseous material. A large abscess occupied the upper pole, a gray tubercle or two was seen in the cortex, but most of the disease was in the medulla. The ureter was thickened and dilated. In this case the disease was in a more advanced stage than in the one just mentioned.

As disintegration progresses the functional area of the kidney becomes more and more reduced and the urine diminished until it escapes in infrequent drops. Finally, in some cases, the kidney is entirely destroyed, and no urine is secreted. As I have already said, the specific gravity is reduced in almost every case of tubercle of the kidney, and in a large proportion it is 1005 or under. In tuberculous kidney, pain in the loin may be entirely absent so that the diuresis cannot be due to this cause. A deposit of tubercle communicating with the pelvis seems sufficient of itself. As in renal calculus, a balance seems to be established between the output of fluid on the two sides. In early cases, when active diuresis is present, the sound kidney does not secrete its normal quantity of water, whereas later, when the affected kidney is in process of destruction, less and less fluid is secreted by it, and more and more by the sound kidney until finally all the work falls on the latter.

UNILATERAL PYELITIS

Thirty-nine cases of unilateral pyelitis were examined. Of these 33, or a little over 84 per cent, showed a diminished specific gravity on the affected side. One case had a diminished specific gravity on the sound side. In the remaining cases the specific gravity was equal on the two sides. When recovery takes place, the difference in specific gravity on the two sides disappears, as shown in a few cases I had the opportunity of examining. The specific gravity on the affected side may be as low as 1005 or under, as against 1015–1025 on the sound side. In other cases the difference is less. The following is an example of a case of medium severity.

A woman, aged 36, was examined 6 weeks after the onset of her illness. She had frequency of micturition and pain during the act, with occasional small quantities of blood in the urine, X-ray examination was negative, and coliform bacilli were found in the urine. The flow from the right side was more rapid than that from the left. The specimen from the right side was pink-colored, contained pus and blood, and had a specific gravity of 1005. That from the left was free from pus, contained a few red cells due to trauma, and had a specific gravity of 1015.

These cases rarely come to operation but on palpation the affected kidney is frequently enlarged and tender. Once more we have a unilateral diuresis associated in these cases with inflammatory signs in the affected kidney.

TUMORS OF THE KIDNEY

Nine cases of tumor originating in the kidney were examined. In 7 of these, or 77 per cent, the specific gravity was lower on the affected side. One of these had a calculus in the renal pelvis. In addition, there were 4 cases in which the kidney had been involved by extension from a neighboring tumor in the abdomen. In 3 of these there was diminished specific gravity on the affected side. In the remaining case the specific gravity on the affected (left) side was higher than on the sound (right) side, but the right kidney was movable. As a rule in cases of tumor the difference on the two sides is not so great as in stone or tubercle. In some a mild degree of pyelitis is also present on the affected side. The following cases, uncomplicated by pyelitis or stone, are examples.

A woman, aged 60, complained of renal colic and hæmaturia. On the affected side a steady stream of blood-stained fluid was discharged with each efflux. This specimen had a specific gravity of 1005, was alkaline, and contained blood but no pus. On the sound side the urine was clear amber, sharply acid, deposited urates on standing, and had a specific gravity of 1015. The kidney, examined on removal,

was not much enlarged; it showed a projection about the size of a tangerine orange on the outer surface. On section, in addition to the main growth there were areas of a light salmon-pink color, varying in size from that of a pea to that of a walnut, scattered through the kidney. The growth projected into the pelvis and polypoid masses of small size were found in the veins at the hilus, partially blocking some of them. The upper pole and a very small portion of the lower pole were free. The growth proved, on microscopical examination, to be a hypernephroma.

A man, aged 60, with a history of attacks of painless hæmaturia, was examined in an interval. The specimen from the affected (left) side was very scanty, neutral in reaction, had a specific gravity of under 1005, contained much albumin, a few red cells, but no pus and no casts. That from the sound side flowed freely in jets, was acid, and had a specific gravity of 1015. Indigocarmine, injected into the buttock, appeared on the sound side in 18 minutes, but no color could be detected during examination on the affected side. The kidney was very difficult to remove, the pedicle was hard to define, the renal vein being as large as the vena cava, and filled with growth. The latter occupied the lower half of the kidney and scattered areas in the upper half. Death took place, and, postmortem, the vena cava was found filled with growth from the level of the renal vein to the opening in the diaphragm. The growth was not adherent to the vessel walls. It proved to be a typical hypernephroma.

These 2 cases demonstrate that growths may affect the kidney (a) by reducing its secreting area, (b) by projecting into the pelvis and to some extent obstructing the outflow of urine, and (c) by seriously blocking the veins leading from the organ.

The result is, in advanced cases, very greatly reduced renal function. A reference to accounts of experiments on animals is interesting in this connection. Cushny states that Goll found that obstruction of the renal vein causes no increase in the urinary flow, but, on the contrary, arrests the secretion completely. He refers to work by Paneth who made a very careful examination of the effects of partial obstruction of the vein and agreed with his numerous predecessors that the urine is lessened in amount and soon contains albumin and blood if the outflow is retarded for long. He also mentions the experiments of Rowntree, Fitz, and Geraghty, who found that in maintaining partial constriction the urine was sometimes slightly increased: on prolonged slight constriction the urine contains albumin, casts, and blood without any significant change in the amount of fluid, but as the constriction and passive congestion are increased the secretion diminishes, and the excretion of such foreign substances as lactose, ioddies, and dyes is much delayed. Clinical study would seem to confirm these observations in animals, bearing in mind that the amount of kidney substance available for secretion is diminished in the case of tumors.

CONGENITAL CYSTIC KIDNEY

Two cases were examined. In one the specific gravity was low (1005) on both sides, and both specimens contained albumin.

The patient, a woman aged 27 years, suffered from frequent attacks of hæmaturia, and nearly died from loss of blood. A colleague removed the bleeding kidney, but the patient succumbed 10 days later from uræmia. The organ consisted almost entirely of cysts. There was some kidney substance in the central area but this was also much broken up by cystic formation. Microscopical examination showed, in addition to the cysts, chronic interstitial nephritis.

The second case occurred in a woman aged 49 in whom a tumor was accidentally discovered in the left loin. Pyelography showed a much distorted pelvis. The specific gravity of the specimen on the side of the palpable tumor was 1005 as against 1010 on the opposite side. There was more than a trace of albumin on the side of the tumor, and a trace on the opposite side. Operation disclosed a polycystic kidney. The fellow of the opposite side was explored through the peritoneum and found to be similarly affected, though to a less degree. Nothing further was done. In this case the lower specific gravity occurred on the side on which the disease was more advanced.

HYDATID CYST OF KIDNEY

This case was seen during the war.

The patient was an Australian soldier in whose case I was greatly interested, and whom I followed from hospital to hospital till his examination was completed and his kidney removed. He had a tumor in the left side, and gave a history of hæmaturia and the passage of small cysts per *urethram*. The flow on the affected side was quite free and the specimen was watery, opalescent, neutral in reaction, had a specific gravity of under 1005, and contained a trace of albumin, a few leucocytes, ureteral epithelium, an occasional red cell, but no hooklets. That from the sound side was scanty, clear amber, acid in reaction, had a specific gravity of 1015, deposited urates on standing, and was free from albumin. The kidney was removed by Lieut.-Colonel McClure of the Australian Army Medical

Service. The vessels of the pedicle were diminished in size and their walls thickened. The pelvis was somewhat dilated and small hard concretions, which proved to be uric acid calculi, were found here and there in the remains of the kidney. The main part of the latter was replaced by a large mother cyst containing numerous daughter cysts. About a quarter of the kidney remained uninvolved. This portion was fibrotic in the central part, with a small amount of normal-looking kidney at the cortex.

(The thickening of the blood vessels incidentally mentioned here is, of course, a very common occurrence in kidneys that are becoming obsolete from tubercle or other cause, and contributes to the natural "nephrectomy" which is the terminal stage in certain surgical affections of the kidney should the patient survive long enough.)

HYDRONEPHROSIS AND PYONEPHROSIS[1]

Fifteen cases of hydronephrosis and four cases of pyonephrosis were examined, and all showed a diminished specific gravity on the affected side. Cases of pyonephrosis in which thick pus was discharged were not included. In 3 cases hydronephrosis was associated with an accessory renal artery passing to the lower pole. Mr. Hurry Fenwick[2] suggests that this abnormal artery bowstrings the ureter at the site of crossing and perhaps sets up local spasm. Lowered specific gravity on the affected side is a common sign in this condition and may aid in diagnosis. Its absence, however, does not exclude this abnormality.

It is, of course, common knowledge that a thinned-out kidney is likely to be associated with urine of low specific gravity. The following case shows the value of the specific gravity test combined with pyelography.

A man, aged 24, had had three attacks of renal colic on the left side at 5-month intervals. The left kidney could not be felt and X-ray examination excluded stone. There was no history of hæmaturia, and the urine was free from albumin, blood, and pus. The ureteral catheter drew no urine until it had passed the ureteropelvic junction when fluid was discharged in frequent drops. The specimen thus obtained was pale amber in color, acid in reaction, had a specific gravity of 1005, and was free from albumin, blood, and pus. The specimen from the sound side had a specific gravity of 1025. Pyelography showed the typical shadow of hydronephrosis. At operation the kidney was seen to be hollowed out into a multilocular sac with a much-dilated pelvis. There was a small patch of renal tissue at the upper pole. The stricture was situated at the ureteropelvic junction.

It is interesting to note that in this case the condition, which must have been of long standing, only declared itself a year or so before operation, and that no abnormal constituents, such as blood, pus, or albumin, were found in the urine from the affected side.

MOVABLE KIDNEY

Fifteen cases of movable kidney were examined, and in 8 of these the specific gravity was lower on the affected side. The difference was not great as a rule, 1015 on the affected side as against 1020 on the sound side being a rather typical example. I have, however, seen it 1005 on the affected side as against 1015 on the sound side. In this case the patient had a dropped kidney and renal colic on the left side. X-ray excluded calculus. The only other sign was diminished specific gravity on the affected side. Pyelography showed a normal pelvis, and a sigmoid bend in the ureter. Nephropexy cured the patient. In 2 cases the specific gravity was higher on the affected side. These cases may be explained by the kinking of the ureter which is often present. According to the modern theory the slight obstruction thus caused delays the flow and allows of reabsorption of fluid and concentration of the urine. As previously pointed out, however, the obstruction of the ureter may act as a stimulus which produces reflex diuresis on the affected side. The latter result would appear from my observation to be the more frequent. I mentioned this matter to Professor Cushny, and he states in reply: "The higher specific gravity in some cases of movable kidney may, as you suggest, be best explained by the slight kinking of the ureter. You must remember that in these cases of obstruction one sometimes has a paradoxical increase in the urine on the obstructed side which arises, I think, from a reflex from the kidney."

There is another factor to be considered in movable kidney and that is kinking or torsion of the vessels. I am unable to say how far this may alter the character of the secretion.

[1] Keith and Pulford. Experimental hydronephrosis. Arch. Int. Med., 1917, xx, 853-878.

[2] Hurry Fenwick. Ureteric Meatoscopy in Obscure Diseases of the Kidney. London: J. & A. Churchill, p. 118.

RENAL HÆMATURIA

Thirty-seven cases classified under the heading of renal hæmaturia were examined. These were due to such diverse conditions as congenital hæmophilia, Henoch's purpura, bilateral nephritis, and the condition known as "essential renal hæmaturia" or "symptomless hæmaturia." In 28 out of the 37 the specific gravity was equal on the two sides. In the condition described as "essential renal hæmaturia" or "symptomless hæmaturia" the specific gravity is, as a rule, equal on the two sides, and the absence of evidence of disease of the kidney, as seen at operation, would rather lead one to expect this. If there is a decided difference between the specific gravity on the two sides one would be inclined to suspect some more tangible cause than that found in these puzzling cases. So far as I have been able to judge, a comparison of the specific gravity on the two sides in cases of renal hæmaturia, without other signs, has not been of great service in diagnosis. I had hoped that such a comparison, when the patient was not bleeding, might have located the side affected. To determine the bleeding side the patient must be examined during an attack of hæmaturia.

RENAL PAIN

Forty-four patients were examined for pain in the renal region of such a nature and of sufficient severity to be dignified by the term "renal colic." Some of these cases were examined under circumstances of difficulty—some in France during the war, and some in outlying districts in Ireland where X-rays were not available. At any rate, a definite diagnosis of the cause of the pain was not made. In 27 out of the 44, or just over 61 per cent, the specific gravity was lower on the side of the pain. In 3 of these there were a few pus cells and a small quantity of albumin in the specimen from the affected side. These were diagnosed as stone, but no confirmation of this is forthcoming, and they have been lost sight of. In no less than 17 cases the urine was free from albumin, pus, and blood. The only evidence of a renal origin was pain, with diminished specific gravity on the affected side. A few of these were actually operated on for suspected calculus with a negative result. One case at least suggests that the pain was referred to the sound kidney. The specific gravity on the side of pain was 1025, and albumin was absent. On the apparently sound side the specific gravity was 1015 and albumin was present.

A few cases had pain on both sides, and in one of these a diminished specific gravity and a small quantity of albumin were present on one side. I have no doubt that renal pain, from whatever cause, is capable of producing a reflex diuresis on the affected side. As our methods of diagnosis become more perfect, cases of renal pain of unknown origin will become much fewer, but I imagine that painful spasm of the ureter, apart from any demonstrable lesion, is a possible explanation in some cases.

WOUNDS OF THE KIDNEY

Nineteen cases of gunshot wounds of the kidney were examined. In 9 of these the specific gravity was lower on the affected side. Infarcts were commonly present in these cases; in some there was evidence of infection as indicated by the presence of pus and micro-organisms in the urine, but in others the urine from both ureters was normal. In one case the specific gravity was 1005 on the sound side as against 1015 on the injured side. The functional capacity of the uninjured kidney, as shown by the output of phenolsulphonephthalein and urea, was diminished. In the remaining 9 cases the specific gravity was equal on the two sides. All the cases were examined within 3 months of the injury. Having already discussed this class of case at some length in the *British Journal of Surgery*, 1917, v, No. 18, and at the Conférence Interalliée held in Paris in November, 1918, it is unnecessary for me to do more than refer those interested to my previous writings.

From the foregoing detailed cases and others unclassified, I am satisfied that when dealing with unilateral lesions, one of the most important factors in determining which kidney is the seat of disease, is the marked reduction in the specific gravity of the urine from the affected side.

REGENERATION OF RESECTED URINARY BLADDERS IN RABBITS[1]

By HELIODOR SCHILLER, M.D., F.A.C.S., Chicago

REGENERATION generally is defined as the reiterated formation of a lost part or parts of a morphological unit, or the new formation of lost cells from cells of the surrounding tissue. It means the power to replace a lost part in such a manner that the new-formed part corresponds with the lost one in form, structure, and size. This faculty is innate in each cell of the plant and animal kingdom; in the latter both in the protozoa and metazoa.

There are two forms of regeneration: the physiological one, for instance, the constant reformation of epithelial cells, hair, blood cells, etc.; and reparative regeneration, which we see as a sequel to loss of tissue substance following trauma. Closely related to regeneration is the process of compensatory hypertrophy, as observed in the glandular organs of the vertebrata, for instance the kidneys, ovaries, etc.

A difficult question is the histogenesis of regeneration, the question of the origin of the cell material for the formation of the regenerated part. Bord's law, *omnis cellula e cellula eiusdem generis*, seems fairly established for the higher vertebrata, but in the lower metazoa conditions are quite different and varied. Not even the strict dividing lines between ectoderm, mesoderm, and entoderm are respected, and regeneration of ectodermal organs from the entoderm and vice versa are repeatedly observed.

Those organs in animals which constantly and physiologically are replaced have also the highest power to regenerate after traumatism, as for instance the epidermis, mucous membranes, the blood. With the increased phyletic development of the animal species the regenerative power diminishes; the higher the state of development of the metazoan organism, the less its power for regeneration. It decreases with increasing age and, in the mammalia, is lowest after maturity has been reached; regeneration decreases parallel with the phylogenetic and ontogenetic development of the animals. The power to regenerate whole members, limbs, etc., has been lost in the more highly developed animals; in man it is confined to regeneration of tissues only.

The ultimate cause of regeneration is to be found in the bioplastic energy inert in each cell. This bioplastic energy becomes kinetic through the loss of tissue and the loss of resistance, which the lost tissue exerted upon the potential bioplastic energy of the surrounding normal tissues. But not only the loss of tissue with its loss of restraint, but also the mechanical stimulus, the trauma, is a formative factor. The location of the injury, the function of the injured organ, the age of the animal and its condition, light, chemical agencies and lastly, the influence of the nervous system are to be counted; however, investigation by Loeb has shown that the rôle of the latter is not at all important; transverse section of the cord does not necessarily hinder regeneration.

Concerning regeneration of the bladder as a whole in the mammalia little is known. However, a great literature exists on the question of regeneration of smooth muscle in the human. Busachi (1) found regenerative processes in smooth muscle fibers, numerous instances on the seventh day following an injury to the prostate, intestines, and uterus; Baumgarten notices instances in the smooth muscle layer of the bronchi; Stilling and Pfitzner (2) found that defects of smooth muscle are first replaced by connective tissue, which in turn is gradually replaced by smooth muscle fibers. In general, it is believed that in the human there is little tendency for regeneration of smooth muscle. Mall (3), in his extensive investigation of the healing of intestinal wounds, found the only sign of regeneration of smooth muscle fibers in the muscularis mucosæ, while the cut ends of the muscle layer did not show any signs of regeneration after 6 weeks.

Still there exists a most active regeneration of smooth muscle fibers in the reformation of blood vessels and regeneration of smooth

[1] From the Nelson Morris Memorial Institute for Medical Research of the Michael Reese Hospital.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig 5.

Fig. 1. Normal, medium-filled bladder of a 6-month old rabbit.
Fig. 2. The new bladder 6 months after extirpation.
Fig. 3. Nine months after extirpation.
Fig. 4. One year after extirpation.
Fig. 5. One year, six months after extirpation.

muscle fibers certainly cannot be denied in the human.

My experiments were performed on rabbits under 6 months. The extirpation of the bladder was done as extensively as possible, the bladder being extirpated clear down to the ureteral orifices and anteriorly, close to the urethra; the cavity left was hardly capable of holding ½ cubic centimeter of fluid. The rabbits stood the operation very well; only two out of nine animals were lost through infection. After the elapse of 3, 6, 9, 12, and 18 months the animals were reoperated upon, and the new-formed bladder removed. In one case the new-formed bladder was extirpated as described in the previous operation and again after 3 months a good size, reformed bladder was found. The new-formed bladder did not have the smooth external surface of the normal bladder; there were numerous adhesions to the adjacent tissue, but the bladder, corresponding to the lapse of time since the operation, had attained a good size and the last one after 18 months, when distended by fluid, was about one-third smaller than a normal bladder. No changes in the ureters or pelvis of the kidneys could be found.

Objections could be raised against the use of the word regeneration of the bladder. It could be contended that we deal here with plain hyperplastic conditions, analogous to the immense hyperplastic and hypertrophic conditions met in bladders of tabetics or in bladders with strictures below the bladder. I will give now the histological description of the specimens which Dr. O. T. Schultz, director of the Nelson Morris Institute, kindly furnished me and his conclusions.

21P371 (3 months after operation). The bladder wall has three distinct layers. The inner is made up of large polyhedral cells, which form a layer from 6 to 15 cells thick. These cells are so closely placed that cell boundaries cannot be distinguished. Their nuclei are large, vesicular, and oval or round. In the deepest layer of cells the nuclei are slender and long and lie with their long axes parallel to the surface. On the free surface is a thin layer two or three cells thick, in which the nuclei are shrunken and condensed. This thin layer of cells apparently represents the epithelial portion of the mucosa. The denser, more prominent membrane composed of polyhedral cells is a regenerated connective-tissue membrane which, in those portions of the bladder where the epithelial layer is very thin, forms the chief constituent of the mucosa. In other portions of the bladder the epithelial layer is thick, distinct, and composed of large cells. Where such a well-developed epithelial layer is present the underlying connective-tissue membrane is thin, dense, and its cells are more elongated and mature. The section shows the condition last described comes from the lowermost portion of the bladder, and is, perhaps, some of the original normal bladder. The mucosa in places is thrown into broad, low folds. Beneath this inner layer is a second or middle layer of loose connective tissue corresponding in structure to submucosa. This layer is from two to three times as thick as the inner layer. Just beneath the mucosa it contains a few groups of lymphocytes. In a few of the broader folds of the mucosa the submucosa extends upward into the folds; elsewhere it takes an even course. The outer half of the submucosa is traversed by numerous, very slender bundles of smooth muscle, most of which are cut longitudinally or obliquely. This group of muscle

bundles corresponds to the submucous muscular coat of Ellis. The outer layer is composed of smooth muscle and varies somewhat in thickness. In some places it has about the same thickness as the mucosa; in other places it is as thick as the submucosa. The muscle bundles which make up the outer layer vary in size and run in various directions. Often the bundles are slender and are continuous with those of the deeper portion of the submucosa. The muscle coat is covered by a thin layer of connective tissue. At one point this layer is increased and contains a group of foreign body giant cells, which have probably been formed about suture material, although none of the latter is now present in the tissue.

21P1036 (6 months after operation). This bladder also has three distinct layers. One-half the mucosa is thin and has the same character as in the section described above. In the thicker portion of the wall the mucosa is markedly folded and has two distinct layers. The superficial one is two to four cells thick and is composed of large polyhedral cells with prominent cell boundaries; the cytoplasma of these cells, which are evidently epithelial in type, is coarsely vacuolated. Beneath this layer is a denser one, which has the general characteristics of the mucosa of the section first described. The submucosa throughout is thin; it is most prominent in the folds of the mucosa. The muscular coat forms a distinct and complete layer, the inner half of which is composed of slender bundles, the outer half of larger bundles. The muscle coat is of approximately equal thickness throughout. The greater thickness of one part of the wall is due to folding of the mucosa.

21P1037 (one year after operation). The mucosa is a thin, dense layer, in which the nuclei are more spindle-shaped than in the corresponding layer in the other specimens; in consequence, this layer has the appearance of a fibrous membrane. On its free surface there are, in places, a few cells of epithelial type; at one point these cells form a definite layer of considerable surface extent. The mucosa is thrown into broad, low folds. The submucosa is thicker than either the mucous or muscular layers. It is composed of loose, areolar tissue, in whose outer half are slender muscle bundles. The muscular coat is composed of larger bundles, which run in various directions.

22P58 (one and one-half years after operation). The mucosa is covered by a complete and distinct layer of transitional epithelium from four to eight cells thick. This rests upon a very thin, fibrous membrane noted in the other specimens. The mucosa forms short and broad or long and slender folds. Beneath the mucosa is a submucosa whose thickness forms about half the thickness of the bladder wall. Its tissue is rather dense and is not so loosely arranged as in the other specimens. The muscular coat is less well developed than in the other specimens. In some places it is thinner than the submucosa, and in other places thicker. Its muscle bundles are rather slender, and do not extend up into the deeper layer of the submucosa as in the other sections.

In all the new-formed bladders the normal layers are present and bear the usual relation to each other. It is conceivable that such a condition might be brought about by mere mechanical distention of the portion of the bladder left behind, associated with hypertrophy of the original elements. The most striking feature in the reformation of the bladder is the thick subepithelial layer of the mucosa which is formed in the earlier stages of the process. The marked development of this layer suggests that in the beginning it takes an important part in re-establishing both the size and the form of the bladder in the earlier stages, and its later transformation into a thinner layer of more mature tissue corresponding to that of the normal rabbit bladder, would indicate that the formation of this layer, at least, is a regenerative process and is not due simply to distention of the bladder remnant.

A close study of these histological findings gives definite proof that we are justified in speaking of a true regenerative process in these reformed bladders; the muscle fibers in the new-formed wall are described as slender, so are the muscle bundles. If we had to deal with hypertrophic and hyperplastic conditions, we would expect just the contrary. Hyperplasia no doubt takes place shortly following the resection, but soon regeneration sets in and plays an important part.

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DIVERTICULA OF THE BLADDER IN CHILDREN[1]

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UNTIL comparatively recent years, diverticulum of the bladder in adults was considered very rare, only half a dozen cases having been reported in American literature up to the year 1906. Since then, however, many articles have appeared with numerous case reports, so that, at the present time, the condition cannot be considered very unusual. The increase in cases during the past decade is, no doubt, due to the almost routine application of the cystoscope and X-ray in the study of the diseases of the urinary organs. At the present day, we are in the same position concerning our knowledge of diverticulum of the bladder in children as we were for adults in 1906. After carefully searching the American literature only three case reports in patients under 10 years of age were found. This is rather surprising, because at present most writers favor the congenital theory of the origin of these pouches. In fact, some authors point to the extreme rarity of this condition in childhood, in support of the acquired theory of formation. Undoubtedly vesical diverticula are more frequently present in children than would be inferred, many diverticula being overlooked because the proper methods of examination have not been carried out. It is only in recent years that cystoscopy in children has been used, and we can, no doubt, look forward to an increase in the number of case reports as soon as this procedure is more popular.

INCIDENCE

It is by no means possible to state in exact figures the incidence of vesical diverticulum in the young, for the cases reported by one author are quoted by others without mentioning explicitly the source of information. As a result, some of the series overlap, making the number of cases appear greater than it really is. That the condition is very infrequent may be attested by the following. None of the standard textbooks of pediatrics even mention this anomaly. Hinman (8) collected a series of 209 cases of diverticula, from 1899 to 1919, in which but one occurred in a patient under 10 years of age. Fischer (7) collected 48 cases from the American and German literature, up to 1910, in which 6 were in children below 14 years of age (clinical and autopsy findings). Two children (8 and 12 years) were cured by operation. The youngest was in a child of 20 months. These cases were probably the ones described by Englisch (6). Single cases are reported by Wallfield (21), McNeil (16) and Young (23), the latter's being included in Hinman's series. A search of the German literature makes no reference at all to this condition in children since the very comprehensive paper compiled by Englisch (6) in 1903. In this article, the author collected one hundred and seventy-one vesical diverticula in which calculi were found associated (operative and autopsy statistics). Twenty-two occurred in children below 10 years of age, the youngest being an infant 8 days old. These cases are cited by Englisch, in support of the congenital theory of their formation. Durrieux (5), in an excellent monograph which appeared in 1901, reports in detail 195 diverticula of the bladder, 13 of which occurred in children below the age of 10 years. In 8 of the 13, calculi were found associated. A diverticulum was found in the fœtus in two instances. In no case was the diagnosis made by cystoscopy or cystography. The majority were discovered on the operating table or at postmortem. Some of the cases described by Durrieux were also cited by Englisch. Analyzing most of the published articles, which have appeared during the past two decades, approximately 600 cases of diverticulum of the bladder have been reported; between 25 and 30 of these occurred in children below the age of 10 years.

ETIOLOGY

Diverticula have been classified as true and false, the former comprising those in which all the coats of the bladder are present in the

From the Surgical Service of Dr. Beer, Mt. Sinai Hospital; read before the American Urological Association, Atlantic City, May 27, 1922.

sac; whereas the false are formed by mucous membrane alone. Two types of true diverticula, the congenital and acquired, have been described, and at the present day, despite much careful investigation, a considerable difference of opinion still prevails, concerning the underlying etiological factor. No attempt will be made here to discuss this point in detail, for it has been ably presented in late years by other writers. Suffice it to say that there are supporters of each theory. Cabot (3), Rathbun (18), Israel (12), and Hofmokl (10) are of the opinion that the great majority of diverticula are congenital in origin; others, Howard (11), Lerche (14), Wagner (20), Hinman (8), and Thomas (19) consider them all acquired. Then there is a group of observers (Englisch, 6; Judd, 13; Fischer, 7, etc.) who are of the opinion that both factors (congenital and acquired) are responsible for their development. Until recently, Lower (15), who has had considerable experience in the treatment of this condition, stated that these pouches are practically always acquired. However, as a result of Watson's recent publication (22), Lower now inclines more to the belief that "there is a congenital predisposition to diverticula." The fact that these pouches had been found in the fœtus was used as an argument in favor of their congenital origin. Watson, in a study of the development of the lower genito-urinary tract, found it possible to observe the vesical cavity in its progressive development, from early fœtal life until birth. "In the course of these studies, certain pictures of the bladder cavity have been of striking significance, and it appears that certain factors are present, which may be of importance in determining the formation of diverticula." Watson believes that, whereas there is a congenital predisposition to diverticula, "their clinical recognition during adult life is hastened, and their dimensions greatly increased by any of the factors that would bring about increased vesical distention or increased activity of the bladder musculature." One further favors such an opinion after carefully studying many of the case reports in adults, when it will be found that the duration of urinary symptoms often dates back 10 to 15 years, sometimes even to early childhood.

The following report is based upon three cases of diverticulum of the bladder, observed during the past 6 years; two occurring in young children, and one in an infant of 9 months. Before describing them in detail, it will be well to discuss, in a general way, certain features to show wherein this condition in the child differs from that in the adult. Attention has been called to the fact that in congenital diverticulum other anomalies in the genito-urinary tract, such as double renal pelvis, double ureter, spina bifida, etc., are frequently present. In one of the three cases there was a hypospadias; the others showed no anomalies.

Number of diverticula. Two symmetrically placed pouches were found in the infant; the other two patients had single sacs. The size of the pouches varied from that of a small plum to that of an orange.

Location. As in the adult, the site of predilection was in the neighborhood of the ureteral orifices. The position of the sac is of more importance than the size, for small diverticula in close proximity to the ureter, by compromising its lumen, do far more damage than large ones which are so situated as not to involve the ureters. In these three cases, the diverticulum was found so closely adherent to the ureter as to occlude its lumen, requiring division and reimplantation into the bladder.

Sex. All three cases occurred in males; there is no reported case of a diverticulum in a female child. In the adult, but 10 in 225 cases were in females.

Age. One patient was 9½ years old at time of operation; the second, 3 years, and the third, 9 months.

Urine. A marked pyuria was present in all three instances. It is a curious fact that we rarely see these cases early in their course when the urine is clear. It is not until urinary infection supervenes, bringing on an added train of symptoms, generally acute in character, that medical advice is sought.

Position of ureteral orifice in relation to sac. In two of the cases, the diverticulum lay anterior to the ureter. In the third, the right ureter opened into the diverticulum, the orifice of which had a contractile sphincteric

action. A real sphincteric action of the diverticular opening is very rare, and has been described but a few times (Buerger, 2; Pagenstecher, 17; Blum, 1). Twelve cases have been reported in the literature, in which the ureter opened into the sac.

Residual urine. It is of interest to note all of the cases showed a residual urine, varying in amount. The infant had complete retention; catheterization twice daily yielded 12 to 14 ounces of urine each time. In this instance, the retention can be explained by the pressure of the two large sacs causing obstruction at the bladder neck. After excision of the pouches spontaneous urination occurred. The other two patients had smaller amounts of residual urine. In Case 3, there was never more than 1 ounce of residual urine, yet the bladder could be palpated, reaching as high as the umbilicus. At operation, this was found to be due to a marked hypertrophy of the vesical musculature.

DIAGNOSIS

The diagnosis of this condition in children should not entail more difficulties than in the adult. True, we are denied the information which can be obtained by a recital of subjective symptoms, but this is not so important, for at best, the evidence so obtained is uncertain. The symptomatology of diverticulum, even in the adult, is by no means sufficiently clear to class it as a clinical entity, and the same applies to this condition in childhood. It is of interest to note that, in contradistinction to the history usually obtained in adults, the duration of symptoms was very brief, and the onset sudden, in all three instances. In two cases, the initial symptom was an acute retention, in the other, a hæmaturia which first occurred 6 days prior to admission. Pyuria was present in a marked degree in all. Undoubtedly, these diverticula were present since birth, but it was not until urinary infection supervened that the condition became acute. Two of our three patients had been treated for pyelitis, pus having been found in the urine. It might be well at this point to digress for a moment on the subject of pyuria in childhood. The presence of pus in the urine seems to be a sufficient excuse for the diagnosis of pyelitis. We have examined a number of children within the past few years, treated for long periods of time for pyelitis, in whom serious diseases of the lower urinary tract were present, the kidney infection being a secondary involvement. One should be extremely careful, especially in male children, before attributing a pyuria to a pyelitis. In none of the cases had a cystoscopic or X-ray examination been made, prior to admission to the hospital. This is not surprising, for these diagnostic procedures have not as yet been accorded their due recognition in the study of urological diseases in the young. Having determined the presence of pus in the urine, the next step should be to make a careful abdominal examination, inspecting and palpating carefully the suprapubic region. The importance of this cannot be over-emphasized. In our 3 patients, there were always varying amounts of residual urine, with consequent distention of the bladder. A protuberance in the suprapubic region was distinctly visible, and the bladder could be palpated, reaching to the umbilicus. Such a distended bladder should immediately focus our attention on the two conditions which cause residual urine in childhood. These are the chronic retentions of urine due either to a mechanical obstruction, or to a neurological condition, or a diverticulum of the bladder. Should the distention be asymmetrical, it would lead one to suspect the presence of a diverticulum. Catheterization should follow, note being made of any obstruction in the urethra and of the amount of residual urine. A definite diagnosis, however, cannot be made, without resorting to the use of the cystoscope or cystogram, or both combined. Of the two, the cystogram is of more importance in children, and will give more useful information than cystoscopy. Cystoscopy is at times difficult in the young, especially in the presence of a marked pyuria, when it may be impossible to cleanse the bladder sufficiently to obtain a clear picture. Although cystoscopy shows us the orifice of the pouch, it gives no idea of its size or shape. It is even possible, during the course of a careful examination, to overlook a diverticulum with a small opening. Cystography is such a simple procedure that it can be per-

formed, even in very young children, without the slightest difficulty and requires no anæsthetic. In our youngest patient, cystoscopy could not be carried out because it was impossible to obtain a sufficiently clear medium to see through, as the purulent urine from the sac constantly clouded the field of vision. The roentgenograms should be taken in different positions, otherwise a small sac may be overlooked or the shadow of the diverticulum may be obscured by that of the bladder itself. In young children, it is possible to obtain excellent pictures in the lateral, as well as anteroposterior positions. Contrast cystography, as recommended by Hinman (9), may give added information. This is accomplished by taking a plain cystogram after which the solution is drained off and air injected into the bladder and another plate taken. The air-filled bladder stands out in contrast to the sacs which still contain the opaque solution. If cystoscopy and ureteral catheterization are feasible, it may be of value to introduce a leaded catheter into the ureter, to outline its relation to the sac. The passage of an opaque catheter into the sac does not give as valuable information as the cystogram.

PROGNOSIS

In general, it may be stated, that the prognosis is favorable, provided there has not been irreparable damage of kidney tissue. It is surprising to note how well children stand the major operative procedures necessary to effect a cure. Before undertaking operation, it is of extreme importance that kidney function should be carefully studied, and attempts made by hygienic and dietary measures, to put these little patients in the best of condition. Attention may here be called to the fact that in Cases 2 and 3 successful results were obtained although the function was very low. It may be necessary when there is a large residual urine, to drain the bladder with an indwelling catheter, and combat infection by bladder irrigations. By carefully prepared pre-operative treatment, the mortality should be very low.

TREATMENT

Conservative, non-operative measures are of no avail. Constant daily vesical irrigations are useless, as are any other non-surgical methods. Rathbun (18) has suggested a preliminary suprapubic drainage which may occasionally be of value in tiding over a very sick child, until the local and renal condition have improved to a degree warranting more radical procedures. The best results are obtained by radical extirpation of the sac, by an extraperitoneal exposure of the bladder. Good results have also been obtained in the adult by the intravesical excision, advocated by Young (23); however, the former operation should be the one of choice. The technique of operation is similar to that employed in the adult and has been fully described in various publications. A few words as to the proper treatment of the ureter. In a large number of cases, the diverticulum will be found in close proximity to the ureter. The difficulty in identifying the ureter and separating it from the sac when dense adhesions are present, is eliminated by exposing the ureter above the diverticulum, making a small slit in it and passing a bougie down through it into the bladder. This method also gives us immediate information as to its patency. When the ureter is occluded, there is but one course to pursue, namely, its division and reimplantation into another part of the bladder. When the ureter opens into the diverticulum, or adjoins it, two methods of treatment are applicable. Young (24), a number of years ago, suggested a technique which leaves a flap of bladder wall around the ureteral meatus after completely excising the rest of the sac. The flap containing the orifice is then sutured into the bladder wall. Judd (13), recommends that in those cases "in which the ureteral opening is found marginal, the adjoining mucous membrane should be turned into the bladder closure," the meatus being preserved. It is advisable, whenever possible, to employ a technique which does not interfere with the integrity of the ureteral mechanism. In our three cases, the ureter on the side of the sac was found occluded, requiring division and reimplantation into the bladder. Some years ago, Cabot (4) suggested ureteral drainage for the dilated ureters, in which division or the Young flap operation had been done. He introduced a soft rubber catheter into the ureter, reaching up

Fig. 1, Case 1. Cystogram showing distinctly large diverticulum.

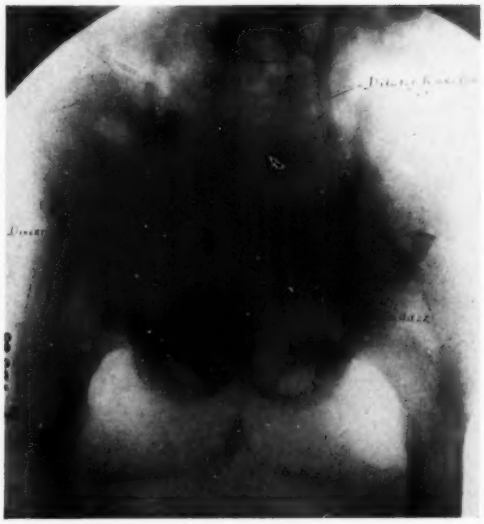

Fig. 2. Cystogram of Case 1 showing dilated ureter.

almost to the renal pelvis, bringing its lower end out through the suprapubic wound. In the cases in which this technique was employed, the postoperative course was unusually smooth.

The following three cases on which this paper is based, are of such unusual interest as to warrant their description in detail.

CASE 1. M. B., male, age 9½ years, admitted to Mt. Sinai Hospital, March 15, 1915. Except for diphtheria, past history was negative. Six days before admission, he noticed terminal hæmaturia, accompanied by pain on urination. After micturition he felt that he had not finished, and could always void a little more. There has been pain in the hypogastric region.

Examination showed a penile hypospadias. The voided urine was turbid, contained much pus, and a heavy trace of albumin. There was slight lumbar tenderness. The bladder was distended, the neurological findings, negative. Phthalein test showed 45 per cent; no tubercle bacilli found in urine. Cystoscopy showed the opening of a diverticulum in the left bladder wall, near the site of the left ureteral orifice. The orifice appeared to open near the mesial posterior edge of the diverticulum. Indigocarmine was seen pouring out in good concentration. The right ureteral orifice was patulous. Good indigo concentration in 14 minutes. A cystogram with argyrol revealed distinctly a large diverticulum, also a dilated left ureter (Figs. 1 and 2).

Operation, March 27, 1915 (Dr. Beer). Extraperitoneal extirpation of diverticulum of bladder and lower end of left ureter, with implantation of ureter in posterior wall; suprapubic drainage. Through a median suprapubic incision, the bladder was separated from the perivesical tissues and the very thin peritoneum pushed off with difficulty. In so doing, the peritoneum was opened, permitting of digital exploration of the peritoneal cavity. After repairing a tear into peritoneum, the bladder was filled with fluid, and the diverticulum was located in between the trigone and rectum, firmly wedged in the pelvis. By drawing the bladder out of the abdomen after it was freed, it was possible to deliver the diverticulum from its bed and ligate its neck. The diverticulum lay in such a position, between the course of the two ureters, that whenever it was full, it of necessity compressed these. The left ureter was markedly distended, and was cut across, about an inch from the bladder, where it became intimately adherent to the inflamed wall of the diverticulum. The ligated neck of the sac and the lower end of the ureter were buried in the bladder wall with several layers of sutures. Then the ureter was implanted in the left posterior wall of the bladder. The bladder was closed following the Kader technique and suprapubic and perivesical drainage applied. Two weeks later the drainage tube was removed and the Kader neostomy functionated well, patient remaining dry. Convalescence was uneventful. Cystoscopy 6 weeks after operation showed ureteral neostomy functionating well. Patient last examined in March, 1922, 7 years after operation. He is perfectly well and has no urinary symp-

Fig. 3. Anteroposterior view of Case 2 showing two large diverticula.

toms. The urine is clear, and shows no abnormal elements. The patient refuses cystoscopic examination, so that it cannot be determined whether or not the neostomy is functionating.

Summary. A boy of 9½ years, with a urinary history of 1 week's duration and pus in the urine. Cystoscopy and cystogram revealed a diverticulum of the bladder, with a dilated left ureter. Operation disclosed a diverticulum, behind the trigone, pressing on both ureters and attached to the left ureter, which had to be sacrificed in its lower 1 inch on resecting the sac. Normal convalescence — patient well 7 years later. No evidences of any obstruction in the lower urinary tract were found.

CASE 2. H. F., a male infant, 9 months of age, was admitted to Lebanon Hospital, service of Dr. Haas, February 7, 1921. I am indebted to Dr. Haas, who asked me to see this most unusual case, a few days after admission. The infant was a full term baby, normal delivery and normally developed. He was well until January 9, 1921 (4 weeks before admission), when symptoms developed which were attributed to indigestion. There were frequent loose, green stools, abdominal cramps and fever. Castor oil was administered, but the illness continued unchanged for the next few days, when the mother noticed that the baby's abdomen was becoming progressively more distended. At about this time, it was also noticed that very little urine was voided, and then urination stopped for one day. No specific significance was attached to this. Previous to this, no urinary symptoms had been noticed. The temperature rose to 104°, and a diagnosis of intussusception was made, and immediate operation advised. A surgeon called in consultation, concurred in this diagnosis, which was made on the history of diarrhœa, abdominal distention, and a large mass which could be palpated, abdominally and per rectum. At operation, as well as we could determine, no intussusception was found, but instead an enormously distended bladder reaching above the umbilicus was discovered. The abdomen was immediately closed, a catheter introduced and 32 ounces of purulent urine withdrawn. For 3 days following operation, there was complete retention, requiring daily catheterization. Then spontaneous voiding in small amounts ensued, mainly dribbling in character. Catheterization had to be carried out daily on account of the large residual (12 to 18 ounces). For the past 3 weeks the temperature fluctuated from normal to 104°. The infant became progressively worse, lost considerable weight, became very anæmic, took little nourishment, and had a number of convulsions. The baby was admitted to the hospital February 7, 1921, in a most desperate condition. The admission notes read as follows:

Examination. The infant is comatose, makes continuous sucking movements with its tongue, which is thick, dry and coated. There are convulsions of the upper and lower extremities from time to time. The abdomen is distended, and the bladder can be palpated, reaching to the umbilicus. The temperature ranges between 102° and 103°. It can, therefore, be seen from this description that the baby was in a most desperate plight. Daily catheterization revealed a residual, varying between 10 and 18 ounces of turbid urine, acid in reaction, specific gravity 1023, loaded with pus, and containing a heavy trace of albumin. Cultures of urine showed colon bacilli and staphylococcus aureus. The phthalein test was less than 10 per cent for 2 hours. Blood urea showed 45 milligrams per 100 cubic centimeter, non-protein, nitrogen 98.4. Indigocarmine did not appear in the urine until 10 hours after injection. X-ray of urinary tract was negative. In order to improve the baby's condition, it was considered advisable to resort to catheterization twice daily, followed by bladder irrigations; water was forced, being given by mouth, rectum, and hypodermoclysis. Under these measures, there was some improvement noted in the general condition although the functional tests showed no change. Cystoscopy could not be performed on account of the impossibility of obtaining a sufficiently clear medium, despite prolonged irrigations. A cystogram was then taken, injecting 12 ounces of 20 per cent sodium bromide. The roentgenograms taken in the lateral and anteroposterior position showed distinctly two large diverticula, one on each side of the bladder (Figs. 3 and 4).

A definite diagnosis having been established, the question of operation arose, but it was considered advisable to wait until the general condition and renal function showed more improvement. This was accomplished by April 19, more than 2 months after admission to the hospital.

Operation, April 19, 1921, Dr. Hyman. Ether anæsthesia. Through a median suprapubic incision, the

bladder was exposed, found markedly enlarged, thinned out and flaccid, reaching as high as the umbilicus. After separating the bladder from the peritoneum, the viscus was opened, and two large diverticula were found, one on each side of the bladder. The orifices of the diverticula admitted the index finger, and each sac was found intimately adherent to the bladder and surrounding tissues. By introducing a finger in the sac, it was found that its mobilization could be more readily carried out. The sacs, both the size of oranges, were in this manner freed extraperitoneally down to their entrance into the bladder. The right ureter was seen, normal in size, running along the posterior wall of the diverticulum, from which it was readily separated. The right sac was then excised, and the opening in the bladder wall closed with two layers of sutures. The left ureter, considerably dilated, was found firmly adherent to the posterior wall of the sac, from which it could not be separated. About an inch above the meatus, the ureter was found to be strictured so that the smallest probe could not be introduced, either upward through the orifice, or downward through a small incision made in the ureteral wall. At this time it was realized that the kidney on this side was most likely very seriously damaged, but it was considered advisable to adopt conservative methods. The sac, with about an inch of ureter, was excised, and the bladder opening closed with two layers of sutures. The ureter was then reimplanted into the left posterior wall, allowing a half inch or so to protrude into the bladder. The internal urethral orifice was explored with the index finger; no contraction or evidences of obstruction were found. The ring was smooth and soft, and the tip of the little finger could be easily introduced through it. (There was at no time any obstruction to the passage of catheters, or bougies through the urethra.) The bladder was closed in layer sutures, allowing space for tube drainage. The abdominal wall was sutured, drains placed in prevesical space. Time of operation, 55 minutes.

Pathological report. Sacs have a smooth glistening appearance and are thin-walled. Microscopically, specimen is covered with a narrow zone of epithelial tissue, which ranges from flat to cuboidal cells. Within this lining is loose connective tissue with numerous blood vessels and sparsely infiltrated with small round cells. Surrounding this layer is a dense muscular layer.

Result. Following operation, the baby was considerably shocked for the first 24 hours; from then on, improvement was steady. Drainage through the suprapubic tube was profuse, and the urine became considerably clearer. From week to week, the general condition improved; the infant gained weight, temperature dropped to normal. Within a month, the phthalein test was 45 per cent for 2 hours. The suprapubic wound closed, except for a tiny opening at its lower end through which purulent urine constantly escaped. Despite all treatment, it was found impossible to close this sinus. On examination one day, it was found that by pressure over the left kidney, the flow through this opening was considerably increased and it was then realized that the profuse purulent drainage was probably due to a pyonephrosis with a pyo-ureter. Under these circumstances, there was little likelihood of closing the sinus, unless the kidney was extirpated. This state of affairs persisted for almost 7 months, during which time the baby improved remarkably. The local condition remaining the same, the parents finally consented to another operation which was performed November 29, 1921 (Dr. Hyman). A suprapubic incision was first made, and the sinus was traced from its lower end. It was found to communicate with the enormously dilated left ureter. This was the ureter which had been reimplanted, and had evidentally become partially detached at the site of the neostomy. The sinus was therefore extravesical. The baby was then turned on his side, and a left lumbar incision made, and after considerable difficulty a complete nephro-ureterectomy was performed, removing the kidney and ureter, down to its vesical end in one piece. The kidney was completely destroyed, being merely a pus sac, and the ureter was so dilated as to be at first mistaken for large gut. The lumbar wound was closed in layers, and a tube introduced into the bladder for drainage. The child quickly recovered from the shock following this procedure, which lasted almost an hour. Despite an otitis media, which later developed, the baby was discharged from the hospital 6 weeks after this operation with both wounds closed, and voiding a clear, normal urine. On last examination, a few weeks ago, the baby was found to be in excellent condition; he has gained considerable weight, seems to have no difficulty in voiding, and looks the picture of health.

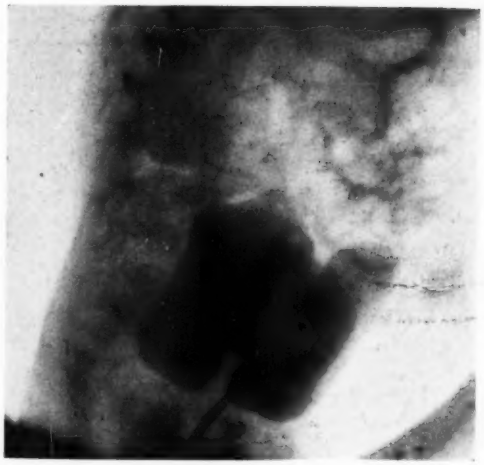

Fig. 4. Lateral view of Case 2, showing diverticula.

Fig. 5, Case 3. Cystogram shows a small diverticulum on the right side of bladder.

Summary. An infant 9 months of age was seized rather suddenly with acute abdominal symptoms. Operation for intussusception revealed instead a distended bladder. Then it was realized for the first time that the trouble was due to a vesical condition. Cystography revealed bilateral diverticula which were excised and the left ureter which was compromised, was divided and reimplanted. Subsequent failure of the suprapubic wound to heal, due to a pyo-ureter on the left side; nephro-ureterectomy, complete recovery. No evidences were found of any obstruction to urination.

This is probably the youngest case on record in which a diverticulum was successfully removed and the patient recovered.

CASE 3. S. L., male, age 3 years, admitted to Mt. Sinai Hospital, service of Dr. Beer, February 11, 1922. Normal delivery—whooping cough, otherwise well, until 6 months ago, when child had retention of urine, relieved spontaneously. Since then, urine has been cloudy, and he has had attacks of painful urination. He has pain in the back and in both loins occasionally. He sweats profusely, but he has no chills.

Examination showed an anæmic, undernourished child. The abdomen, below the umbilicus is protuberant, and the bladder can be distinctly palpated. Lower pole right kidney is palpated. The urine is turbid, contains a trace of albumin, and is full of pus. Catheterization is accomplished without obstruction. Only 1 ounce residual. The enlarged bladder was more the result of a markedly hypertrophied bladder wall than an actual dilatation. X-ray of urinary tract was negative. Phthalein test showed

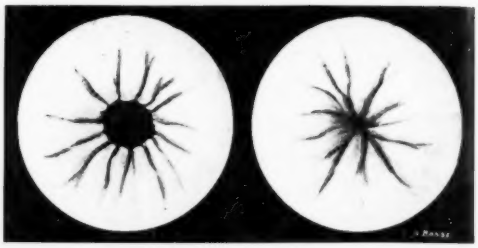

Fig. 6. Cystoscopic picture, Case 3, diverticulum open and closed, showing sphincteric action of orifice.

10 per cent for 2 hours. Blood chemistry shows increase of non-protein nitrogen (49.9). Cystoscopy (ether anæsthesia) shows bladder slightly inflamed, left meatus normal, right meatus cannot be seen. In this region there is an opening of a diverticulum, the orifice of which has a distinct sphincteric, contractile action. When closed it is difficult to make out its location; when open, it discharges a turbid fluid. At the time, it was surmised that the right ureter opened into this diverticulum. No indigocarmine came from either side in 15 minutes' observation (appeared in voided specimens some time later; late indigocarmine excretion). Culture of urine showed staphylococcus aureus. Cystogram showed a small diverticulum on the right side of bladder (Fig. 5).

The condition of the child while in the hospital became progressively worse. High temperature developed which was attributed to a right pyelonephritis.

Operation was decided upon, and was performed February 25, 1922 (Dr. Beer). Suprapubic incision. Deep down in the pelvis on the right side and firmly adherent to surrounding parts and ureter, is a small diverticulum. Marked peridiverticulitis. The ureter which was considerably dilated and found to open into the diverticulum, was divided at its constricted portion just as it entered the sac. The sac was then dissected, free to the bladder wall, and excised. The opening was closed with chromic sutures. The ureter was implanted into the posterior wall of the bladder. The left ureter was seen in the bottom of the pelvis, markedly dilated, probably due to the obstruction caused by the extensive peridiverticulitis. The bladder was drained through a stab wound, and a rubber drain placed in prevesical space. The child was considerably shocked after operation and transfusion was necessary. Temperature reached normal in a few days and then convalescence was steady. The urine which was markedly purulent after operation, gradually became clearer. The bladder wound is now closed, and child voids freely. The right kidney is not palpable or tender. A cystoscopy will be done in the near future to determine whether the neostomy is functionating.

Summary. A boy of 3 years with a history of retention and pyuria of 6 months' duration, found by

cystoscopy and cystogram to have a diverticulum which opened into the right ureter. Operation—excision of sac, division of ureter and reimplantation; recovery.

CONCLUSIONS

Vesical diverticula are rare findings in childhood, not more than 30 being found in a review of over 600 cases.

Diagnosis of this condition in children should present no difficulties. Little value can be placed on the history. Physical examination of the abdomen is of considerable importance. A chronically distended bladder especially asymmetrical in outline, should make one suspicious of a diverticulum. The cystoscope and cystogram are absolutely essential in making a correct diagnosis. Of the two, the cystogram will be found more valuable.

No evidences of obstruction, either vesical or urethral, were found in the 3 cases reported in this article. All three diverticula were in immediate proximity to the ureter; in one, the ureter opened into the sac, and as a result, the ureters were compromised to such a degree as to cause obliteration of the lumen, with resultant dilatation. Division of ureter with reimplantation was performed in all 3 cases, with recovery of patients.

Undoubtedly there will be an increase in the number of cases reported as soon as cystoscopy in children becomes more of a routine procedure. The presence of diverticula in patients so young, without evidences of any obstruction, leads one to conclude that they were congenital and that in all probability many of the diverticula in adults have also a similar origin.

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BLADDER NECK OBSTRUCTIONS

Their Surgical Relief in Reference to the Young Punch[1]

By WILBUR B. PARKER, M.D., Los Angeles, California

WE present for your consideration various phases of bladder neck obstructions and their relief from a surgical standpoint; interesting on account of their frequency, the complexity of their symptoms, the conspicuous place that their relief has acquired in surgery in comparatively recent years, but of still greater interest in the prevention of their inoperable sequelæ.

The pathological physiology of the musculature of the bladder neck with relation to increased tone, spasm, dysuria, tenesmus, and acute or chronic retention, has many times failed to be satisfactorily explained by the clinical symptoms and the pathology actually found at the time of diagnosis or of operative surgical relief.

Anatomically, the bladder neck or internal urethral orifice is not a true sphincter except in function, for its muscular structure is that of a double loop. The upper arc is made up of fibers of the external longitudinal bands of the ureteral muscles, which sweep downward to the level of the urethra, uniting in a loop above without raphé formation. The lower arc is formed by fibers of the internal circular layer, fusing with the upper arc, meshed by fibrous stroma, intimately associated with the trigone, prostatic urethra, the prostate, and its capsule. Covered with a sensitive mucosa, it forms an oval with the greatest mass of its unstriped muscle on the floor; and once esteemed without question to be the muscle of continence, but now discredited in this office in favor of the external sphincter, the duty of which—continence—is ever well sustained except in the presence of traumatic or surgical injury, trophic, or central nervous system disease.

The bladder neck muscle, which may be compared to a sensitive automatic relay station, patient, ever watchful, persistent in its care, even if disregarded in a normal genito-urinary tract, but, when outraged, furious to the extent of tenesmus, is more responsive to the removal of the cause of its insult than any other of the guardian sphincters of the body. Its duties are so important, yet so mechanical, that no pathological condition can exist above or below in the urogenital tract or about the rectum for any long-continued period, without sooner or later seriously involving its muscle tone. The bladder neck and its muscle fibers are seldom primarily at fault in these disturbances, although they have only a certain amount of reserve, their hypertrophy is cumulative in like proportions to the pathological syndrome.

The fundamental change in its poise is a physiological one at first, that is, its normal tone, resiliency, and contractibility are heightened, accompanied with a latency of its secondary functions, which can and will often remain temporarily a physiological process as is seen in acute systemic toxæmias and traumatic shocks to the central nervous system. Subsidence of cause is adverse to the rule in bladder neck pathology, except in acute disturbances, and it is difficult to conceive of a decided obstruction without a preceding change in the normal physiology. After increased tone follows spasm of the muscle tissue; overwatchfulness of the contributing stimuli with resultant like proportion of reflex impulses to the external sphincter producing irritability, frequency and dysuria which are often the patient's first consciousness of anything out of the ordinary. The realization of its meaning is always received with consternation by the neurotic, and by an equal amount of disregard in the physically strong; either may have some focal or systemic infective cause, the existence of which he is unaware.

Long-continued spasm of the bladder neck, whether subacute or chronic, conscious or subconscious, in the subjective interpretation must surely culminate in pathological changes, such as hypertrophy, proliferation of fibrous tissue, and eventual reduction of proportion-

[1] Read before the joint meeting of the Pacific Coast Section of the American Urological Association and the Urological Section of the Los Angeles County Medical Association, November, 1921.

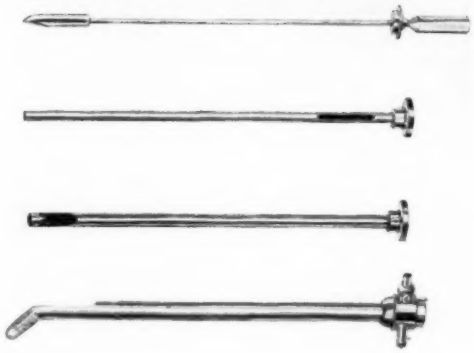


Fig. 1. Braasch punch, noting number of parts and smallness of excisor blades.

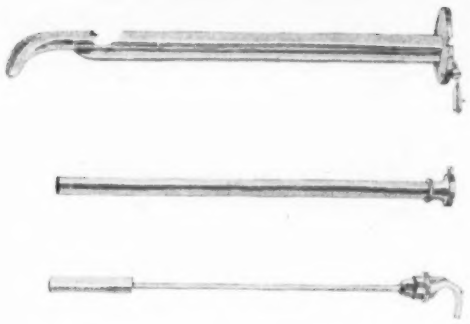
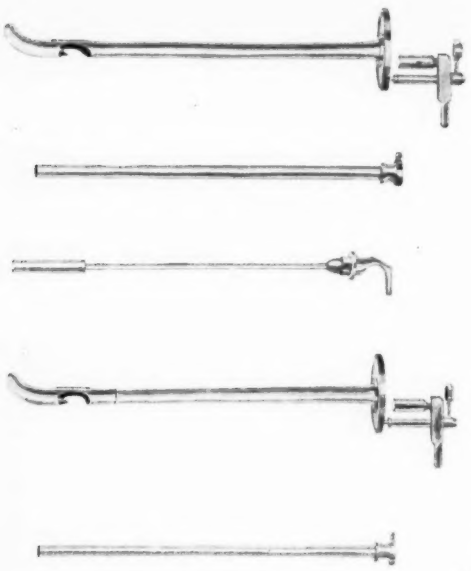


Fig. 2. MacGowan modification, identical with original Young punch, with the exception of an additional light carrier.

ate function with loss of resiliency or a beginning contracture of the neck of the bladder; a phase which once established never diminishes; more often increases in severity with all the complications that may follow; a condition which if not relieved early by elimination of its etiological factors and subsidence of the spasm to the extent that the chronic irritative symptoms with residual urine ceases, goes on in an ever increasing vicious circle, the etiology contributing to the secondary obstruction and the sequelæ in like proportion adding stimuli to both; so that such a syndrome will always have a surgical end for the accomplishment of its relief, or if the patient survives the complications that must inevitably arise in its progress, such as diverticula, hydro-ureters and hydronephrosis, and their attendant functional disturbances in total renovesical degeneration and death. We have remarked that a long-continued obstruction, even if not very severe, plays a greater part in the production of diverticula than a rapid and severe obstruction with great strain, and as the majority of diverticula are of necessity, anatomically and through intra-abdominal pressure, located posterior to the bladder neck, they often dissect downward, between the rectum and the prostate, and when distended with urine they obstruct the bladder neck in much the same manner as an intravesical prostatic lobe or posterior median bar.

Why is all this attention paid to a normally subservient and well behaved group of muscle fibers, covered with a reflected mucosa, known as the bladder neck? Because of its mechanical importance. No bladder is normal, no surgical procedure to relieve obstruction can hope to be a success, unless the floor of the bladder is made and maintained on a level with the floor of the urethra, for it then cannot carry residual urine and will assume its former high resistance to the invasion of pathogenic bacteria. It is also regrettable that through the obscurity in its etiology, chronicity of development and lack of early clinical recognition, the majority of cases must eventually seek surgical relief.

The most common factors in the production of bladder neck obstructions, other than prostatic or adenoma in one or more of the Albarran group of glands are the postinflammatory changes in the mucosa following posterior urethritis and cysto-urethritis existing as cysts, sessile and polypoid, pale, yellow or red, with or without vascular markings and adenoid and papillomatous growths, chronically infected follicles or ducts of the prostate or prostatic urethra in any or all of its quadrants. These conditions, although in their onset apparently insignificant, have a distinct set of symptoms, such as intermittent urethral discharge, without infecting organisms, various degrees of difficulty in the voiding reflex with increased frequency,



Figs. 3 (at top) and 4. The original Young median bar excisor open and closed; note the engaging teeth are external to the excisor blade after excision of tissue is made.

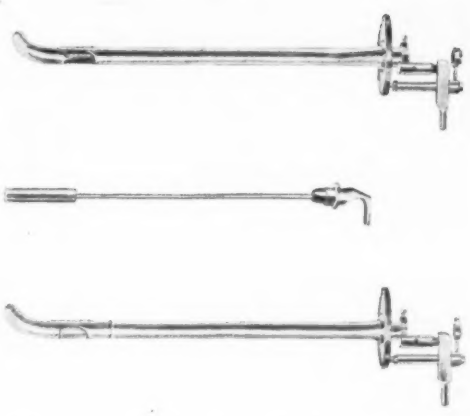
slight or even marked impotence, reflex pain in the anterior urethra, a continuous consciousness of the posterior urethra, and occasional bleeding at the end of urination or hæmaturia, depending on the exact location and character of the pathology.

Excluding the complex obstructions to the voiding reflex, prostatic hyperplasias are most commonly classified as median lobe without median bar formation, lateral lobe with a clinically recognizable median lobe, general hypertrophy, in which neither the middle nor lateral lobes are prominent, and general hypertrophy in which the middle or lateral lobes, or both, are prominent. The surgical relief of the same is today standardized to the extent that we shall not discuss the accepted methods of technique except as to the aid given by a Young punch in assuring a functional result, with the prevention of an undesirable postoperative obstruction. An enormously greater number of prostates have been removed without any attention being paid to possible bladder neck muscle involvement than have been removed after a careful cysto-urethroscopic and cystoscopic study, with due recognition of such lesions present before the time of surgical interference. Why? Because of the lack of knowledge of the significance of the findings to be obtained by this means and no other. For bladder neck obstructions, depending upon their type, and the multiplicity of types that may be found in any one individual, give a definite indicative group of symptoms, that are often overlooked, except by the discerning urological clinician, who is able to visualize the pathology present. Symptoms of prostatic hyperplasia without prostatic findings together with slowness in starting the stream, increased length of time necessary to empty the bladder, diurnal and nocturnal frequency, difficulty of expulsion, often disagreeable dribbling, temporary retentions, various degrees of impotence, and the other symptoms heretofore mentioned, all point to definite bladder neck muscle involvement, the nature of which must be determined by cystoscopy, cysto-urethroscopy, palpation of the bladder neck to note its thickness, between the shaft of the instrument and the examining finger in the rectum, and repeated examinations for the amount of residual urine, which varies according to the phases of bladder neck relaxation. Further there is abnormal resistance to the passage of rigid instruments and especially a cystoscope, a sense which can only be appreciated after long experience, but which has nothing in common with the normal resistance of the patient, which is often increased to a degree of an apparent contracture by the introduction of a metal instrument in the hands of the unskilled. This resistance ranges from a slight sense of spasm at the bladder neck to that of penetrating a tube of wet harness leather; and the necessary amount of depression of the handle of the instrument toward the perineum for the introduction of its beak into the bladder varies in a like proportion to the pathology present. Even so, there is occasionally a universally contracted vesical outlet, that is fibrosed but offers no special resistance to the beak of the cystoscope on attempted intro-

duction or withdrawal, and which admits an ordinary sized Van Buren sound, but which is found at the time of opening the bladder to be a definite contracture, dimple like, with little or no resiliency, raised upward in the bladder or swung loose in a curtain-like membrane, depending upon whether it is associated with chronic prostatitis, prostatic atrophy or prostatic hyperplasia.

Numerous well-trained urologists, dominated by the fear of producing incontinence if the neck is disturbed for any other purpose than the removal of the growth, have refused to recognize this general contracted, nonresilient vesical neck, even when with the bladder open they can see and feel it. But none can refuse to acknowledge the brilliancy of the results obtained usually by the aid of a Young punch in removing the inflammatory tissue, not only as a groove upon the floor, but around the entire circumference of the involved vesical ring. It is well to direct attention to the fact that the true pathology of the bladder neck in reference to a generalized contraction of the entire vesical ring is often camouflaged by œdema. Therefore, at the time of cystoscopic diagnosis, one is apt to be misled. Digital examination of the internal orifice at the time of the initial cystotomy for drainage does not always insure against the surprise of finding on the day of major relief, the obstruction to be a postinflammatory band, a true fibrosis, or generally contracted bladder neck coarctation which does exist, with and without median bar formation, in all forms of prostatic hyperplasia and postinflammatory prostatic atrophy.

Can you imagine this fibrosis as being possible of occurrence without the presence of increased tone, chronic spasm, hypertrophy, increase of connective tissue, atony or atrophy of muscle, scar-tissue contraction, and last of all, that super sclerosis in which degenerative possibilities naturally, to the experienced clinician, suggests the type as potentially or probably malignant. The fact that so many of these cases are not diagnosed before they reach the borderline of the hopeless stage must be due to the fallacious interpretation of the symptoms in their incipiency.



Figs. 5 (at top) and 6. Parker-MacGowan modification of excisor of Young; note an obturator is no longer necessary and the engaging teeth are internal to the excisor blade, after tissue is excised.

A definite sclerosis of the bladder neck, in which the symptoms, etiology, and morbid anatomy of its development does not differ materially from that accompanying post inflammatory atrophy of the prostate, is rare except in obstructive cases of extremely long standing, where the bladder musculature has undergone immense hypertrophy with fatty and fibrous degeneration, or cases with mobile vesical calculi, which contribute by constant traumatic irritation of the orifice direct to its progress; a class to which it is difficult to give permanent relief, and which show a very high percentage of malignancy. (For these and many other reasons it is essential that a microscopical examination be always made of sections taken from all parts of bladder neck obstructions.) Another type of obstruction is the postoperative contracture which may occur following either the suprapubic or the perineal method of enucleation, and is no more common by one approach than the other, where the operator disregards the possibility of the presence or possible development of vesical neck fibrosis at the time of operation. Prostatic enucleation without the so-called wounding of the internal sphincter occasionally results in a dimple-like contracture set in a tympanum-like fold of the lower bladder segment above the cavity of enucleation and

below the trigone, which also may suggest, by way of description from the bladder side, a prolapse of the anterior bladder wall which carries the internal orifice downward acting like a loose curtain attached on all sides. This complication occurred to a marked degree in one of the earlier cases of our series, following a prostatic enucleation suprapubically. Had a Young punch been used to a greater advantage at the time of the prostatectomy, it would not have been necessary to perform a secondary punch operation, removing the contracture tissue over the entire circumference of the bladder ring, of sufficient depth to feel resilient muscle, in order to obtain a functionally perfect result. The same condition has followed the perineal method of enucleation with the bladder closed and was much more difficult of relief. Also during this series, consultations backed by authentic records have been requested in a certain percentage of cases of perineal enucleations applying afterward to us where no attention was given to an existing contracture by the operators, and therefore were followed by a poor functional result, which necessitated a second surgical interference. There were two other cases we mention with reluctance because though a definite generally contracted bladder neck was recognized upon attempts to excise a groove on the floor, the punch would not engage in the fibrous bladder neck, but did catch in and remove a goodly portion of the prostatic urethra in both cases. As for the suprapubic method, the necessary and unavoidable trauma incident to the ordinary enucleation, preventing a too rapid restoration of the internal sphincter before there is a coaptation of the lower bladder segment to the outer wall of the prostatic capsule and the prostatic urethra, probably explains why this complication does not follow all prostatectomies, especially those with clinical findings, suggestive of contracture and the large hyperplasias with collar-like protuberances around the bladder neck. In this type of case a Young punch has been found a most valuable aid, first, in the dividing of the internal sphincter, posteriorly, preceding an enucleation and, second, if the necessity arises, in dividing a hypertrophied and undermined trigone, following the enucleation, procedures that have since their adoption been a marked factor of safety, in that the enucleation is done with greater ease, permanent provision is made against the closing of the vesical orifice by inflammatory adhesions, and the annoyance of the presence of a shelf of the trigone overhanging the prostatic cavity with its pocket into which instruments of all kinds find their way instead of entering the bladder, in which stagnant urine lies promoting dribbling and stone formation, is prevented and avoided.

1. We wish to compare the different forms of punches or so-called median bar excisors, some of which are not limited in their use to a small quadrant of the bladder neck, posteriorly or to superficial tissue, which may obstruct the urinary outlet. First the Braasch punch, which is electrically lighted on the same plan as the direct Braasch cystoscope, a feature of value in attempting bladder neck obstruction removal with the bladder closed, but of no aid in the MacGowan modification of Young's technique, of approach either through a perineal urethrotomy or suprapubic opening. The greatest disadvantage is the smallness of the section removed. The second disadvantage is the number of parts; although they are simple and the instrument is easy of operation, if properly cared for, their simplicity cannot be compared to that of an instrument consisting of only two essential parts, an excisor shaft and a cutting blade.

2. Next is shown the MacGowan modification of the Young punch, the same as the original, except for the sheath light carrier which is not any more efficient than the lighting system of the direct Braasch, although it does give a better lighted field than the transmitted light of Young punch. The only objection, other than those shown later to the Young punch is the increased size of the instrument in accommodating a light sheath.

3. Third is shown the original Young median bar excisor, a classical instrument but a dangerous one even in skillful hands. You will note the immobilizing teeth are on the outer surface of the obdurator when in place,

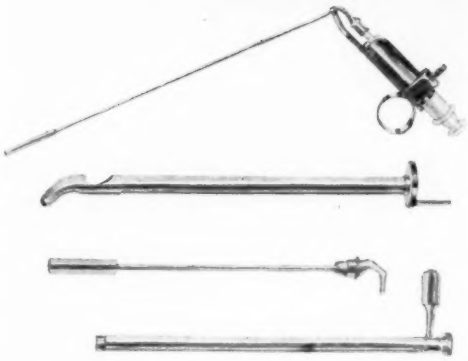


Fig. 7. Caulk modification of Young punch with electric cauterizing blade.

as also outside the excisor blade after the excision is made, hence subject to being bent outward by dense obstructions, and when this happens, unmercifully lacerate the bladder neck and urethra upon withdrawing the instrument. It becomes engaged easily in tissues not intended for engagement, and there is much difficulty in freeing its hold, except by forward motions, as lateral motion often increases the difficulty or renews it in a possibly more disastrous location. The teeth have broken off, have chipped the blades and have been caught in all manner of disagreeable locations from the ureteral folds to the meatus, to the extent that according to urological history suprapubic cystotomy and external urethrotomy have been necessary to free their awful hold. The writer's greatest shock from the lack of faith in the teeth of this instrument arose after a dense section of fibrous tissue was excised from the bladder neck, using a heavy cutting pressure when one of the teeth bent outward. Withdrawal of the sheath and blade containing the section was also accompanied by a strip of urethral mucosa 2½ inches in length from the floor of the posterior and anterior urethra. Although recovery was uneventful, the inevitable result of chordee, with which he was unacquainted before was a nightly visitor for a long time thereafter.

4. MacGowan and myself, operating with mechanics, have again taken the liberty to

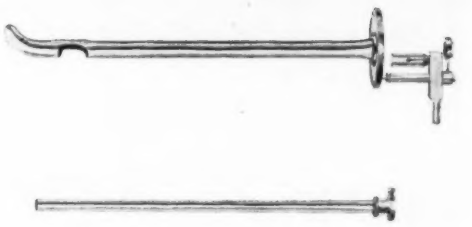


Fig. 8. Young's modification of original punch, in which necessary engaging teeth have been discarded.

modify the original Young punch, thereby producing a safe instrument, so far as concerns any of the former elements of danger. The teeth are on the inside of the obdurator, an accessory no longer necessary. This modification cuts clean, does not tear, does not become engaged where not desired, and should this occur from being unintelligently placed, is easily disengaged by lateral as well as forward motion. There is no danger of breaking or bending of the teeth, which are built up in the instrument in the form of small pyramids with relatively broad bases and when the excision is made, the teeth are on the inside of the blade, making the withdrawal of the sheath as harmless as that of a sound. The fact that the immobilizing teeth are on the inside does not lessen the efficiency of the instrument, and there are no tissues in the bladder neck, prostatic capsule, or trigone that any operator has a surgical right to remove with the original punch, that cannot be just as easily removed with the modification. The use of the latter in the last half of our series has reduced postoperative rises in temperature; tenesmus, and epididymitis have been much more infrequent, the average convalescence is shortened. Still more gratifying since the use of the modification, not a single postoperative hæmorrhage has occurred whereas before in 20 per cent of contracture operations alarming hæmorrhages were frequent, some of which required the use of a Hagner bag or suture of the bladder neck for their control.

5. Dr. John Caulk at a later date has also modified the Young punch by adopting an electric cautery cutting blade, instead of the cold knife excisor blade, and has ruled out

the teeth entirely, depending upon the congealing quality of the heat for immobilization of the tissue to be excised and withdrawn. In cases requiring minor relief, it is superior to the original Young punch or any of its modifications, but it is yet to be proven of equal value in those requiring major relief from dense contractures nor is it reasonable to assume in these cases that convalescence will be shortened, and possibilities of complication be lessened through a burning operation where a slough must be thrown off before granulation is complete.

6. The latest Young punch modification is the original instrument, without any teeth for engagement of tissue to be excised, a radical change, indeed, from a dangerous instrument, considered useful, to one that would appear to lack all of its former efficiency. Might not its use, from a mechanical standpoint, lead to poor surgical results, through lack of proper immobilization of the obstructions necessary to be removed, not to mention the loss of sense of touch in the tissues desired to be engaged?

CONCLUSIONS

1. That due to recent research on living patients with definite clinical entities of bladder neck obstructions, and not upon necropsies of those with advanced types of obstruction, more attention to diagnosis and relief forces a conclusion that posterior median bars exclusive of the Albarran type of hypertrophy are not so common as generally believed, and that a widely contracted bladder neck will be found a most common cause in the fourth and fifth decades for progressive vesical irritability and retention, that the causative influences are often not only local infections, but remote foci and systematic toxæmias.

2. That the method of choice for classical contractures of the bladder neck of all types requiring major relief are best approached by the MacGowan modification of Young's technique, either suprapubically or through external urethrotomy incisions, for the educated finger is far superior to poor light illumination and to the same touch through an instrument intra-urethrally in determining the removing of scar tissue to the level of resilient muscle, so that one may know the floor of the bladder again to be level with the floor of the urethra. Further, the operator may rest assured that the greatest of all dangers following this type of surgery, — hæmorrhage,— is easily prevented and controlled.

3. That the modified Young punch or median bar excisor is to date the most efficient and safe instrument that is not limited in its field, for surgical relief of the bladder neck, associated with prostatic atrophy, prostatic hyperplasia, vesical calculi, or hypertrophied trigone.

4. That it is a most valuable aid, preceding, during, and following prostatic enucleation for incising the bladder neck and trigonal shelf, removing capsular tags, and small portions of prostatic tissue that are difficult of immobilization.

5. That a more satisfactory explanation is yet to be advanced as to bladder neck tone and the etiology of irritability, hypertension, spasm, and tenesmus, in reference to the production of contractures of the mechanical type.

6. That the mortality rate has been nil, that hæmorrhage, although all former precautions were employed, has not occurred in bladder neck obstruction, relieved by use of the modified Young punch; that postoperative absorption is less, and convalescence is shortened. Epididymitis in males past the procreative age is prevented by vasectomy. Last, but not least, the preparation of the patient for any type of major bladder neck surgery is of the utmost importance.

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A CLINICAL INVESTIGATION OF VULVOVAGINITIS[1]

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VULVOVAGINITIS may justly be termed a free lance disease. Although physicians in diverse specialties accept the condition for treatment, there is no uniformity in diagnostic procedure or mode of therapy, or is there any accepted plan of procedure endorsed by a single specialty. The treatment of the condition in the hands of various specialists varies from simple hygienic measures to the most painstaking local applications, but it is for the most part empirical and frequently irrational.

About a year ago a joint meeting was called of the gynecological and genito-urinary departments of the Michael Reese Hospital Dispensary to discuss the problem of the disposition of vulvovaginitis patients. No agreement could be reached. One physician claimed that all the cases were gonorrhœal; another said they were never gonorrhœal; one held they always arose from contact, and another believed filth was the sole cause.

With such diversity of beliefs as to etiological factors, naturally no plan of procedure could be outlined, and it was decided to investigate the cause of vulvovaginitis, clinically and bacteriologically.

To learn whether or not this chaotic condition in reference to vulvovaginitis was peculiar to members of our staff, or typical of the profession of today, a questionnaire was recently sent out to six special groups of physicians or institutions, comprising ten pediatricians, six general practitioners, ten urologists, ten gynecologists, five contagious disease hospitals, and nine orphanages. The questions asked were:

1. Do you treat vulvovaginitis in little girls?

2. Upon what criteria do you base your diagnosis?

3. What do you believe to be the cause of the condition?

4. How do you usually treat the condition?
   A. By whom is treatment carried out?
   B. How often?

5. What is the usual duration and course?
   A. What complications?

6. Upon what criteria do you determine cure?

Of the fifty questionnaires sent, thirty replies were received. Of the thirty who replied, nineteen, comprising six pediatricians, three general practitioners, three urologists, five gynecologists, one contagious hospital, and one orphanage, answered Question 1 in the affirmative.

Question 2 was answered by nine that diagnosis was made by the presence of vaginal discharge; nine by smears; and one by culture.

[1] Read before the Chicago Gynecological Society, June 16, 1922. (For discussion, see p. 123.)

Question 3, ten answered gonorrhœa either alone or mixed with other organisms, seven non-gonorrhœal infection; one uncleanliness; one masturbation; one worms; one direct or indirect contact.

Question 4, twelve used silver salts in solution or ointment; two used mercurochrome instillations; four advised irrigations; two, hygiene alone.

Question 5. The majority answered that the course varied indefinitely from 1 month to 6 or 9 months and recurrences were not infrequent; one answered, course, 1 week to 10 days; one never felt sure of cure. Ten of the nineteen never saw complications, while arthritis, endocarditis, ophthalmia, pruritis, bartholin abscess, urethritis, pyelitis, were each mentioned once; pyosalpinx and cystitis each twice.

Question 6. Ten gave no definite criteria of cure. Four considered disappearance of discharge and negative smears sufficient, but no definite number was stated. Three said cure was obtained on disappearance of clinical signs; two, on negative smear or culture after provocative silver injections; one said microscopic examination determined cure, but did not state what was to be found upon examination.

This evidently is the status of vulvovaginitis today. Apparantly no group considers the cause of the disease the same. Although this is a summary of but a small number of inquiries, it is representative and sufficiently varied in special practice to prove the utter lack of uniformity in our comprehension of the disease. Is this lapse due to the scarcity of literature upon the subject? Not at all, but no two authors accept the same etiology, and therefore they fail to agree on diagnostic methods and therapeutic procedures.

For instance, in reports of clinical investigations of the subject we find that Spaulding reported 83 cases of vulvovaginitis of which 56 were gonorrhœal; 9 non-gonorrhœal; 1 associated with acute infectious diarrhœa; 1 with pneumonia, and 1 after a fall. She mentions a non-specific variety following chicken pox and measles due to staphylococcus and streptococcus.

R. M. Smith says there is a definite group of vulvovaginitis with variable non-gonorrhœal bacterial origin and reports two cases in which micrococcus catarrhalis was found.

In the Johns Hopkins Dispensary, Hurdon found 63 per cent of the cases to be gonorrhœal.

Robinson gives among the causes of non-specific vaginitis, uncleanliness, decomposing smegma, urinary incontinence with decomposition, traumatism from masturbation or rape, and also states that there is a very infectious variety in which the gonococcus cannot be found.

Abt, in presenting this subject before the Venereal Disease Institute on March 15, 1922, said that 70 to 80 per cent of children with vulvovaginitis had gonorrhœal infection. Indirect contact, he stated, was the mode of transmission, and that "bad technique" was responsible for 98 per cent of the cases. By this he meant common sleeping quarters, toilet seats, bath tubs, public baths, swimming pools, wash cloths, underclothing, etc. Occasionally direct contact, as in cases of sex violence, is the mode of infection. Institutions were emphasized by Abt as an especially potent factor, there being rapid spread of the infection after the admission of an infected case.

Epidemics of the disease have been frequently reported, the earliest being the one reported by Atkinson (1878), according to Baer who in 1904 summarized the literature on this phase of the subject and reported the results of an investigation of a hospital epidemic of 13 months' duration. He also cites the interesting report of Skutsch (1891) of the infection of 236 girls with gonorrhœal vulvovaginitis, contracted in a public bath, none of the boys using the same bath becoming infected.

Apparently there are three distinct types which require recognition; the acute gonorrhœal, the non-specific, and the epidemic type (usually gonorrhœal). Each type is capable of further differentiation into acute and chronic or recurrent and into severe and mild forms.

Under diagnosis, also, we find a lack of harmony in the literature.

Fig. 1. Fireless cooker (Stein-Burn) and copper carriers for transporting cultures without chilling.

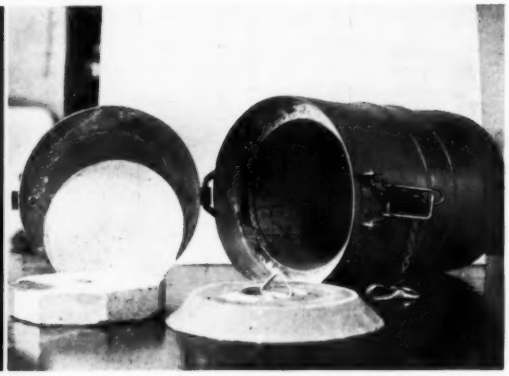

Fig. 2. Fireless cooker, showing the warming brick and the asbestos pad.

According to Norris, the presence of discharge and the finding of gonococci in the smear is diagnostic. The difficulty of detecting the organism in chronic cases when discharge is scant is emphasized. Suspicious cases should be ruled out only after three negative smears taken under favorable conditions for finding the organism.

Warden states that the staphylococcus urethræ is often taken for the gonococcus in smears and that cultures alone can differentiate them.

Fischer describes a yellow and a white diplococcus in the vagina in simple catarrhal vaginitis in which gonococci are never found.

Norris and Mickelberg are of the opinion that clinical evidence is of greater diagnostic value than the stain method for, in the chronic stage of gonorrhœa, the discharge is scant, gonococci few, and may be atypical morphologically and tinctorially. They warn that other cocci may be present which may confuse one; and that some strains of gonococci are more susceptible to certain stains than others, and that there may be errors in the performance of Gram's stain. A diagnosis made by the staining method is of no value except when made by one skilled in this work and negative results have no significance unless frequently repeated. They advise obtaining smears from centrifuged washings of the vagina, using a soft rubber eye syringe. Kolmer advocates cotton swabs wet in weak bichloride solution moved about in the vagina and then rolled, but not rubbed, over the slide.

Rubin, after studying 255 cases in the Mt. Sinai Dispensary in New York, concludes that too much value is placed on the smear examination. He believes that the diagnosis rests upon cultural and serologic tests. Provocative silver injections have been recommended by many as an aid in obtaining positive smears.

Under the caption of "treatment," we find very little emphasis placed upon prophylaxis. Abt, however, urges isolation of cases, especially in institutions, and the temporary isolation of all admissions to children's institutions until three negative smears are obtained. He emphasizes the importance of a general technique of asepsis in the handling of children including the wearing of gloves by the nurse, and the use of individual beds, thermometers, soap, towels, bed pans, etc.

Of the many methods of active treatment described in the literature, a few will reveal the diversity of opinion.

Gellhorn in 1920 described the method used in treating vulvovaginitis in the City Hospital, St. Louis, Missouri, consisting of daily injections into the vagina of a 1 per cent silver nitrate in an ointment of equal parts of lanolin and white vaseline. Discharge and excoriations disappeared rapidly under this treatment and the average duration of treatment was 3 to 4 weeks. The treatment is

TABLE I.—SUMMARY OF ANSWERS RECEIVED FROM QUESTIONNAIRE

Question	Do you treat vulvo-vaginitis in little girls?	Upon what criteria do you base your diagnosis?	What do you believe to be the cause of the condition?	How do you usually treat the condition? (a) By whom is treatment carried out? (b) How often?	What is the usual duration and course? (a) Complications?	Upon what criteria do you determine cure?
GROUP ONE	1. Yes	Vaginal discharge and the finding of intracellular gram negative diplococci or other organisms in association with irritation of vulva.		By mercurochrome 1 to 2 per cent. Mother is instructed at the office. Once to twice a day.	From a few to many months. Arthritis, pruritus, endocarditis, and ophthalmia.	Absence of discharge and repeated negative smears.
	2. Yes	1. Gram negative diplococci. 2. Purulent discharges.	True cases contacts. We see many pseudo cases (non-specific) in most of which the diplococcus is usually gram positive if a diplococcus is present.	One per cent silver nitrate in vaseline, packing of vagina by syringe with rubber tip. By nurse or mother. Once or twice daily. At bedtime if by mother and once daily.	Two to 6 weeks with not infrequent recurrence of a milder type and fewer organisms. Very few except occasional cystitis.	Repeated negative smears (3 at intervals of at least 3 days).
	3. No					
	4. Yes	Presence of vaginal discharge.	Frequently gonorrhœa; sometimes colon bacillus infection.	Two per cent silver nitrate in equal parts lanolin and vaseline. Interne or nurse at hospital or by myself at office. Three times a week.	About 3 months with this treatment. Have seen arthritis. Pyosalpinx.	Disappearance of discharge macroscopically. Disappearance of discharge pus and bacteria microscopically.
	5. Yes	A vaginal discharge with many leucocytes, few organisms, and these intracellular and gram negative.	The gonococcus. I believe that the majority of cases diagnosed as gonorrhœa are not due to the gonococcus and are not gonorrhœa. In other words, I do not believe the ordinary laboratory diagnosis is reliable.	Daily injection of 1 per cent silver nitrate in equal parts of lanolin and petroleum. Mother or nurse. Once a day. Nothing else. No irrigations.	Of true gonorrhœa, a month or two. Of those commonly diagnosed as such, many months. None were observed.	Prolonged absence of discharge and of specific organisms. Practically in the hospital, 3 negative smears.
	6. No					
	7. Yes	Pus gonococcus.	Infection.	Permanganate, argyrol, 1 per cent silver nitrate, lanolin and vaseline. Mother, nurse, self. G. C. three times a day.	One to 4 months. None.	Decrease pus; wait; smear; try again.
	8. No					
	9. Yes	Redness, discharge, microscopical findings.		Permanganate and silver salts. Mother or nurse. Permanganate twice daily. Silver 3 to 7 times per week.	Tendency to recur throughout childhood. None.	Disappearance of discharge. Negative microscopical findings. Parents warned "cure" is not to be considered permanent until year or more has passed without recurrence.
	10. No answer					

TABLE I.—SUMMARY OF ANSWERS RECEIVED FROM QUESTIONNAIRE—CONTINUED

Question	Do you treat vulvo-vaginitis in little girls?	Upon what criteria do you base your diagnosis?	What do you believe to be the cause of the condition?	How do you usually treat the condition? (a) By whom is treatment carried out? (b) How often?	What is the usual duration and course? (a) Complications?	Upon what criteria do you determine cure?
	11. Yes	Bacteriological and clinical.	Gonorrhœa in some, infections with other bacteria in others.	Symptomatic. By myself and mother or nurse. Dependent upon the case.	The chronic cases, many months. In my practice the average treatment was 9 months. I had one acute Bartholin abscess in a girl of 3 years. Pelvic peritonitis.	Clinically and to some extent bacteriologically.
	12. Yes	Microscopic examination.	Sometimes gonorrhœa. Sometimes not gonorrhœal. Catarrhal.	Most careful local cleanliness. Argyrol solutions and astringents and gauze wicks. By mother if intelligent or by competent nurse. Once, twice, or more times daily.	Varies, in gonorrhœal cases, weeks. Urinary, urethral. Probably pelvic organs (?). Of latter I am not positive.	Relief of local symptoms. No redness. No discharge and microscopic examination.
GROUP TWO	13. No answer					
	14. No answer					
	15. Yes	Try to find organisms and clinical findings.	Specific and non-specific organisms.	Local deep applications silver nitrate, 10 per cent argyrol to 20 per cent bichloride, permanganate irrigations. Boric pads. Physician, nurse or parent in office or home, mostly home. Local applications about two times weekly, irrigations daily, governed by reaction on tissues.	Mild, non-specific, from a few weeks; specific and neglected, several months. None in my few cases.	Disappearance of local manifestation with no return of symptoms for several months following.
	16. No answer					
	17. No answer					
	18. No answer					
	19. No					
GROUP THREE	20. No answer					
	21. Yes	Gonococci (Gram negative or extracellular in back wash from vagina).	Gonococci most often. Occasionally colon bacillus.	Home. Vaginal irrigations of 1:1000 silvol solution. Office, instillations of mercurochrome 220 and tampons for 12 hours. Mother or nurse at home. Physician at office. Twice daily at home; three times a week at first at office; later once a week	Varies much in our experience, 3 weeks to 6 months. Vaginal adenitis is the only one we have seen often. Occasionally urethrocystitis.	Injections of 1 per cent silver nitrate followed by three negative cultures in wash water under sterile conditions.

TABLE I.—SUMMARY OF ANSWERS RECEIVED FROM QUESTIONNAIRE—CONTINUED

Question	Do you treat vulvo-vaginitis in little girls?	Upon what criteria do you base your diagnosis?	What do you believe to be the cause of the condition?	How do you usually treat the condition? (a) By whom is treatment carried out? (b) How often?	What is the usual duration and course? (a) Complications?	Upon what criteria do you determine cure?
GROUP THREE	22. Yes	Microscopic findings.	Usually the gonococcus, at least in the early weeks.	By irrigations with catheter and instillations of solutions of silver salts used in vagina and urethra. By nurse if possible three times a day.	Indefinite, some are protracted and clear up after incision of hymen when opening is small. Have never seen any complications.	Cessation of discharges and microscopic findings following provocative instillations.
	23. No answer					
	24. No					
	25. Yes	Culture only.	Uncleanliness.	Extreme cleansing, instillations into vagina with medicine dropper. Mother if intelligent, otherwise nurse. Two to three times daily.	Cannot be estimated. Have never seen any complications except once in a specific case. Bilateral pus tubes.	Disappearance of discharge and negative smears.
	26. No answer					
GROUP FOUR	27. No					
	28. No answer					
	29. No answer					
	30. No answer					
	31. Yes	Discharge from vulva. Microscopical test of discharge and urine.	Gonococcus.	Instillations in vulva, vagina, and urethra, 25 per cent argyrol. Myself. Daily.	Eight weeks in the most cases. Indefinite in others where the infection is in the urethra. None so far.	Never felt positive that I cured any of them. Have a number in which microscope does not at present reveal any bacteria.
	32. Yes	Redness of involved area and discharge or discharge alone.	1. G.C. 2. Maceration due to uncleanliness.	Instillation with medicine dropper of 2 per cent silver nitrate into vagina and subsequent douching with mild astringents. Mother or nurse. Once or twice a day. Often enough to keep discharge from irritating.	Months. Chronic infection of Skene's ducts. Ordinarily nothing more.	Absence of visible discharge.
	33. Yes	Microscopic diagnosis on smear.	Gonococcus often. Other bacteria often.	Hygiene, external lysol washing. Nurse or mother. Constantly.	Duration — weeks or months. Course—no complications, healing. None observed.	Microscopic examination of smears.

TABLE I.—SUMMARY OF ANSWERS RECEIVED FROM QUESTIONNAIRE—CONCLUDED

Question	Do you treat vulvo-vaginitis in little girls?	Upon what criteria do you base your diagnosis?	What do you believe to be the cause of the condition?	How do you usually treat the condition? (a) By whom is treatment carried out? (b) How often?	What is the usual duration and course? (a) Complications?	Upon what criteria do you determine cure?
GROUP FOUR	34. Yes	Evidence of inflammation. Nature and persistence of discharge.	Sometimes due to small worms inhabiting the lower rectum, crawl into the vulva and cause itching which causes the child to rub and favor infection.	Mild antiseptic solutions carefully injected. Argyrol if necessary. Mostly by the mother. Daily.	From a few weeks to months according to the nature of the infection and efficiency of the treatment. Have not seen any of a serious nature.	Chiefly cessation of the discharge and absence of gonococci in case of gonorrhœa.
	35. Yes	Discharge, inflammation and microscopic examination.	Infection.	External boric irrigation and instillations of 25 per cent argyrol. Myself and nurse, or mother. Irrigation daily, argyrol same at first.	One week or 10 days. None	Absence of inflammation and negative microscopic.
	36. No					
	37. No					
	38. Yes	Vaginal smear positive for intracellular diplococci.	Direct or indirect contact with the organisms.	One per cent silver nitrate ointment tampon into vagina twice daily. Superyision nurse, twice a day.	Several weeks to months. Pyelitis occasionally.	Discharged when three successive smears are negative for gonococci.
	39. No answer					
	40. No answer					
	41. No answer					
	42. No					
GROUP FIVE	43. No answer					
	44. Yes	Presence of discharge and specific organism.	Of an infectious nature. The nature of the infection depends upon the organism. Masturbation also produces such a condition.	Cleansing the part with boric acid solution and instillation of argyrol into vagina. Graduate nurses. Two to 3 times daily.	Each case varies. Not definite. None observed.	Absence of discharge and repeated negative vaginal smears.
	45. No answer					
	46. No answer					
	47. No					
	48. No					
	49. No answer					
	50. No answer					

simple and can be entrusted to nurses or mothers under supervision. With this method the number of weeks in which children are evacuated is less than the number of months formerly required.

Wacho and Mazer, after failure with Hirst's silver paste, recommended the use of 1 per cent Dakin's oil instilled daily with a medicine dropper, the child in Trendelenburg position. Of 58 chronic cases so treated, improvement was marked in 1 month. Twenty-five cases were cured in 3 months, and 39 were cured after 4 months. Six cases remained uncured. As recurrences were observed in 1 to 4 months after an apparent cure, the authors emphasized the necessity of prolonged observation.

Wolff reported excellent results in 40 cases treated by vaccines (autogenous), no other treatment except cleanliness being used. Abt says vaccines are valueless. Graves, however, states that the benefits from the use of vaccines in vulvovaginitis is so well established that it should always be adopted as a specific part of the treatment.

Reports of the effect of raising the body temperature in gonorrhœal patients have arrived recently from abroad. Following the publication of Weiss, who reported the favorable effect of prolonged hot baths upon fifteen soldiers with acute gonorrhœa, Engwer treated a 3-year-old girl suffering from gonorrhœa of the vulva and anus with a bath at 42° to 44° C. for one-half hour. Two days later the child was cured and she remained so. Ylppo and Bendix each reported a case of vulvovaginitis cured with daily prolonged hot baths. Risseoloda, Scholtz, Nast and Schulz had less favorable results and finally gave up the method. Schulz reported instances of delirium, fainting and cramps following the hot baths. Of 20 cases treated, *no cures* were obtained. The children complained of severe headaches and restlessness; they became weak and drowsy. Schulz warns against the use of thermal baths for children.

Lode used thermal baths also in 7 cases without cure and concluded that the danger to the child is out of all proportion to the benefit gained.

This brief citation of the literature suffices to emphasize the necessity of co-ordinating the mass of material in hand and of presenting an accepted classification of etiological factors and a rational therapeutic program.

In March, 1921, a vulvovaginitis clinic was organized at the Michael Reese Dispensary, and the following procedure suggested by Dr. O. T. Schultz was accepted as a working plan:

All cases appearing at the children's examining clinic with clinical evidence of vulvovaginitis and those having suspicious or positive smears were referred to the special clinic. These were considered gonorrhœal until proved otherwise. A positive gonorrhœal diagnosis was accepted if upon smear examination the following were found: pus cells, with gram-negative intracellular diplococci with typical gonorrhœal morphology. Smears were held suspicious if gram-negative diplococci were extracellular only. To determine whether the organisms in the positive smear cases were truly gonococci or not, cultures were made, the reduced oxygen tension method of Wherry and Oliver as recommended by Herrold being utilized. The cultures were kept warm during transportation from the dispensary to the Institute of Research, in a fireless cooker (Stein-Burn). The smears and cultures, all obtained personally by the essayist, were examined by Miss Ruth Anderson of the Nelson Morris Institute for Research. A wire loop was used in obtaining all culture and smear material.

The summary of our bacteriological results is reported here. A complete report of the same will appear in detail at a later date.

A total of 66 children ranging from 3 months to 14 years of age were treated in the clinic.

1. Fifteen cases (25 per cent) gave a positive smear. In 7 of these the gonococcus was isolated by culture, and in 8 the cultures proved negative for gonococcus.

2. Eight cases were classed as "suspicious," coming to the clinic with a diagnosis of gonorrhœa from a smear examination made in the dispensary. However, all of the smears and cultures made by us proved negative. These were all chronic or recurrent cases with but slight clinical evidence of infection.

3. Twenty-six cases presented the clinical picture of vulvovaginitis. All smears and cultures were negative for gonorrhœa.

4. Seventeen cases were referred by the children's examining clinic as probable vulvovaginitis, which presented insufficient evidence, both clinically and bacteriologically, to be included in the vulvovaginitis group. Excluding this group from the percentage calculation, over 30 per cent of the cases of vulvovaginitis were gonorrhœal.

In addition to the above, two adults' cases are reported:

1. The mother of a three-months-old baby was examined, the infant giving a history of gonorrhœa from birth, with repeated positive cultures and smears. Repeated cultures and smears of mother were negative.

2. A single girl of 18 years, with an acute gonorrhœal urethritis and endocervicitis was used as a control on our cultural methods. Several cultures proved positive in this case, taken in the same way and transported the same days as many cultures of the positive smear cases in which no gonococci could be cultivated.

There were no cases in which cultures were positive and where the smear was reported negative. There were 8 cases in which the smears were positive and the cultures were negative. Thus it appears from our results that the smear diagnosis is sufficient if the smears are examined by an expert, and cultures are unnecessary. If the positive culture were requisite for diagnosis, one-half of our cases of gonorrhœa would have escaped detection. Given a case presenting the clinical picture of vulvovaginitis, and a smear presenting many pus cells with diplococci having the typical gonococcal morphology which are intracellular and gram-negative, a positive diagnosis can be made.

All suspicious and positive cases were treated by us with daily injections into the vagina of an ointment composed of 1 per cent mercurochrome-220 in equal parts of lanolin and vaseline. (Gellhorn's method, substituting mercurochrome for silver nitrate.)

Smears and cultures were taken at beginning of the treatment, again after 2 weeks of treatment with 1 day of rest, and at weekly intervals until three successive negatives were obtained, a week apart. Treatment was then suspended, smears and cultures being taken again in 2 weeks, and if negative finally, in 3 or 4 weeks, to determine cure. No other treatment was permitted except that a *daily tub bath was prescribed.*

Treatments were with few exceptions given by our dispensary graduate nurse, Mrs. Shinn, under our direction. In two instances the mothers were entrusted with treatments after personal instruction at the clinic, and in a few, a visiting nurse carried out the treatment under supervision of our nurse when children could not be brought to the clinic.

The method of treatment which we employed was that described by Gellhorn, and in our experience the mercurochrome 1 per cent ointment proved very satisfactory. The method is simple, painless, and effective, none of the patients complaining about the staining of the skin or clothing.

Summary of the cases treated:

1. *Gonorrhœal—15 cases.* Seven discharged cured in 6 to 16 weeks or in an average of 9.7 weeks. Three still under treatment, 2 of which came to the clinic within the month and 1 (birth infection) is exceedingly refractory, being under treatment 5 months. Two were delinquent in attending the clinic and were transferred to the Frances Juvenile Home. One failed to report for final determination of cure after 10 weeks' treatment and 1 negative smear and culture. Two recurred. One with mild clinical signs was treated irregularly for 4.5 months. The other giving history of vulvovaginitis following rape 1 year ago, cleared up in 8 weeks and suffered recurrence after an attack of measles, and is still under treatment.

2. *Suspicious gonorrhœal—8 cases.* Seven discharged cured in 3 to 11 weeks, or on an average of 6.5 weeks. One treated irregularly in our clinic, at Cook County Hospital and partly by a visiting nurse, and is still under observation.

3. *Non-gonorrhœal cases—26.* Ten resembled the gonorrhœal cases clinically and were treated in the same manner with cure in an average of 5 weeks. Eight were discharged in 3 weeks after three negative smears and cultures were obtained, daily tub baths being the sole treatment. Five were discharged in 2 weeks after two negative smears and cul-

tures, daily baths being the sole treatment. Two cases are still under observation. One recurred after 3 months, giving slight clinical evidence of vulvovaginitis but with negative smears and cultures.

Summarizing our results of treatment we may say that gonorrhœal vulvovaginitis can be cured by daily injections of 1 per cent mercurochrome ointment into the vagina in an average of 9.7 weeks. That suspicious cases can be cured in 6.5 weeks, and non-gonorrhœal cases in 5 weeks.

In 2 gonorrhœal cases recurrence occurred after contagious disease (chicken pox, measles).

In 1 non-gonorrhœal case recurrence occurred from no apparent cause 3 months after treatment was suspended.

It is of interest to note that in six instances sisters were affected at the same time, and in each instance a remarkable similarity in clinical course, bacteriological findings and response to therapy, was noted.

Direct contact (rape) was responsible for four of the gonorrhœal and one of the non-gonorrhœal cases.

According to Treumith the average course of vulvovaginitis is 4.5 months. By the method employed by us the general average of treated cases was 7 weeks, or less than one-half the usual duration. No complications were encountered in our series.

The gynecologist, because of his equipment for vaginal treatments, his familiarity with vaginal smears, and his appreciation of the significance of complete cure of vulvovaginitis is the logical specialist to treat this condition.

Those who accept the vulvovaginitis patients for treatment should agree upon etiology, mode of diagnosis, and principle of therapy, so that results can be properly interpreted. The accepted criteria of cure should be definite and the liability of recurrence emphasized.

CONCLUSIONS

1. Vulvovaginitis is an infection which frequently is gonorrhœal in origin, but may, even in purulent varieties, be non-specific. Filth, unquestionably, plays a part in predisposing to the infection and may be the chief cause in the milder types.

2. Diagnosis rests upon clinical evidence of the disease and smear examination made by an expert. Cultures prove positive in about 50 per cent of gonorrhœal cases and are therefore not requisite for diagnosis.

3. Purulent vulvovaginitis should be vigorously treated by an approved method, such as that suggested by Gellhorn. A daily tub bath is an aid to local treatment and in mild non-gonorrhœal cases, is all that is required for cure.

4. Determination of cure rests upon the disappearance of clinical evidence of the infection, three negative smears at intervals of 1 week after suspending treatment, and a period of observation equal in time to the duration of the treatment.

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METABOLISM READINGS IN EIGHTY-FOUR PREGNANT CASES[1]

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THIS work was begun in July, 1920. A Jones metabolimeter was used throughout the work, and the machine was tested at the factory on an average of every 4 months. All cases previous to April, 1921, were not used. It was felt that the work was too experimental then to justify any conclusions. Since April, 1921, 84 cases have been completed, that is to say, at least one reading was taken previous to delivery and one reading taken after delivery. It has been found that the work was pursued under extreme difficulty because of the failure on the part of pregnant women to take the tests seriously and to report previous to labor. Many cases were not completed for various reasons.

In reviewing the literature on basal metabolism in pregnancy and the puerperium very little was found. Apparently no effort has been made to determine whether the basal metabolic reading would show anything valuable in pregnancy. Baer's article which appeared in September, 1921,[2] is the first and only article which shows this work. His conclusions based on 44 normal cases in late pregnancy showed an average increase from 33 to 35 per cent above normal. Three days after delivery the average metabolic rate was 15 per cent above normal, while 7 to 10 days after delivery it was approximately normal. He also states that the death of the fœtus in late pregnancy was detected in women otherwise normal by a drop in the basal metabolic rate compared with the average in his series.

Magnus-Levy noted a rise of 17 per cent for pregnant women. Zuntz, Carpenter, Mueller, and Hasselbach noted an increase of 4 per cent.

Most of the work done in this series of 84 cases was on private patients. The cases are not consecutive because so many patients failed to report for readings. In most of the cases the reading was taken during the last month of pregnancy, the second reading after delivery being taken anywhere from the third to the sixteenth day postpartum.

In these 84 cases there were 54 normal cephalic deliveries; 2 breech deliveries with extractions; 1 high forceps; 8 mid-forceps; 6 low forceps; 1 craniotomy on a dead fœtus; 7 versions and extractions; and five cæsarean sections. There were 49 primiparæ and 35 multiparæ.

It will be noted from Table I that in pregnancy there is a gradual increase in the metabolic rate the older the patient. The average increase in the rate for all ages is practically 29. This compares favorably with the results reported by Baer. The average rate after delivery including all cases was +21.5. Here his results and mine vary. I am unable to show an average return to normal in 7 to 10 days. Even at the end of 10 to 16 days there was an increase in the rate. This seems logical. The mother has taken on new functions, that of supplying milk. Also the generative organs are undergoing involution. Both of these functions require a greater amount of energy, hence the metabolic rate should be increased. It has not been possible to prove this point because nursing women will not report back to have the metabolic test made. The results after delivery have been divided as shown in Table II.

In the first 3 days 1 patient returned to the average normal metabolic rate. Her read-

TABLE I.—AVERAGE METABOLIC RATE

	Before	After
Under 20 years	26.75	19.00
Between 21 and 25	23.73	15.53
Between 26 and 30	28.23	19.62
Between 31 and 35	33.21	24.35
Between 35 and 40	33.00	28.50

TABLE II.—METABOLISM RATE AFTER DELIVERY

	Rate
1 to 3 days after delivery	27.30
4 to 6 days after delivery	19.39
7 to 9 days after delivery	17.93
10 to 16 days after delivery	22.70

[2] Baer, J. L. Am. J. Obst. & Gynec., 1921, ii, 249.

[1] Read before the Chicago Gynecological Society, June 16, 1922. (For discussion see p. 124.)

ing was +8. In the second 3 days 1 patient reached the absolute normal rate while 10 patients reached a rate of +8 or less, making a total of 11 patients who approximated the normal in 51 cases.

In the third series 1 patient returned to normal. Five patients out of 16 showed a metabolic rate of +8 or less. In the fourth series none of the readings was below +13 in 7 cases. In the entire series, therefore, 18 patients gave readings +8 or less or approximately 21.5 per cent.

In this series there were several patients who showed high blood pressure and other abnormal conditions. I will give briefly the obstetrical histories of these patients. Among the toxæmias of pregnancy were the following:

CASE NO. 108. Para-II, reported at the end of third month of pregnancy, at which time her blood pressure was normal as were the urinary findings. Everything went along smoothly in her pregnancy until the seventh month when she complained of marked œdema, with headache and constipation. This condition appeared within 2 days after she had been examined. On May 13 her blood pressure was 180–100. She was immediately sent to the hospital for observation. While in the hospital her blood pressure varied from day to day, never going below 150 systolic, in spite of diet and other treatment. The baby died *in utero* and was delivered on June 14. It was slightly macerated. The patient left the hospital on June 30 in fair condition.

This case is not included in the table. Because of the patient's hysterical condition we were unable to take the metabolic reading after delivery. The reading taken on May 23 showed a rate of +40.

CASE NO. 1230. Para-I. This was a high blood pressure case diagnosed as a "kidney of pregnancy." In the seventh month of pregnancy she developed marked increase in blood pressure with albumin and hyaline casts in the urine. She was given appropriate treatment but, in spite of this her blood pressure remained at an average of 160 systolic and 100 diastolic. On September 25, 1921, labor was induced, delivery finally taking place after 24 hours, occipito-lævo-posterior and mid-forceps. The metabolic reading on August 23 was +5; on September 29, 4 days after delivery, +18. She was discharged from the hospital with blood pressure of 130–100 and the urine practically clear.

CASE NO. 1274. Para-I. Reported in the seventh month of pregnancy with a blood pressure of 150–74. In spite of active treatment her blood pressure remained near this figure and on July 11 she complained of dizzy attacks and considerable œdema of the extremities and face. Induction of labor was started July 16. It ended spontaneously with occipito-lævo-anterior. The induction increased the blood pressure. The patient also had a polyhydramnios. Very little kidney disturbance was noted until the last 48 hours previous to delivery when albumin and casts were found in the urine. The metabolic reading taken on July 13 was +28; that taken on the 23d was +20. The patient was discharged from the hospital in good condition.

CASE NO. 1282. This patient gave a history of high blood pressure for 4 years previous to the beginning of pregnancy. Father and mother were both high blood pressure cases, the mother having a blood pressure of over 200 constantly. This patient had a considerable amount of work done throughout her pregnancy. She reported first at the fourth month, at which time the blood pressure was 143–80. Reading taken bimonthly until the latter part of October ranged between 138 and 150 systolic and 90 diastolic. In October she developed marked signs of a kidney of pregnancy. Her blood pressure was 180–100. Two metabolic readings were made on this patient, one on September 3 when it was +12 with a blood pressure reading of 130–85; the other on November 8, at which time the metabolic rate was +18 and blood pressure 204–140. The phenolphthalein test made on November 8, showed 5 per cent in the first hour and 30 per cent in the second hour. Blood chemistry taken on November 9 showed non-protein 46.1 milligrams per 100 cubic centimeters of blood.

This patient's baby died *in utero*. She went into spontaneous labor and after the cervix was dilated sufficiently craniotomy was done. The baby weighed 1000 grams and was macerated. At autopsy no pathological findings were noted and no growths were obtained from any of the organs. The metabolic rate 5 days after delivery was +10.

CASE NO. 1339. Para-III. Reported in the eighth month of pregnancy with a blood pressure of 150–80. She complained of roaring in her ears and marked œdema of the hands and legs. She entered the hospital on July 18 complaining of spots before her eyes, œdema of the hands, legs, and face. On the 19th her blood pressure was 160–78 and on the 20th, 174–100. In two previous pregnancies she aborted before 2½ months. She was exceedingly anxious for a living baby. She had a slightly contracted pelvis. Cæsarean section was done on July 20, from which she recovered nicely. The baby weighed 3240 grams. It developed a pyloric stenosis and was operated upon the tenth day, making a satisfactory recovery. The metabolic reading taken July 18 showed +8; 5 days after delivery it was +8.

CASE NO. 401. Para-II. This patient was a chronic nephritic with fibroids of the uterus. In her first pregnancy she developed eclampsia with a blood pressure of 224–120. Her sister died of eclampsia. The patient reported in the second month of

pregnancy, at which time her blood pressure was found to be increased. She returned every 2 weeks and the blood pressure charts showed a gradual increase. She was referred to Dr. Solomon Strouse who advised that the pregnancy be interrupted. On September 6, a hysterectomy was performed. At that time her blood pressure was 150–100 and she showed marked signs of chronic nephritis. The metabolic reading taken on September 2 was +8; taken again 6 days after operation, it was +25. This patient had no temperature rise throughout her convalescence.

Case No. 1190. Para-II. This case was one of toxæmia of pregnancy. The patient had had one miscarriage. She reported in the third month of her pregnancy and blood pressure readings were taken bimonthly. A chronic nephritis was found on the first examination, at which time the blood pressure was 160–73. It remained near this figure until October 21 (8¼ months), when it rose to 188–98. Labor was induced October 21 with castor oil and quinine. She had a spontaneous delivery, right occipito-anterior. Metabolic reading taken on May 24, in the fourth month of pregnancy, showed +30. Taken again on September 27, it was +7. This was one of the patients in whom it was impossible to get a reading after delivery.

Case No. 1360. This patient was an elderly primipara who showed a normal blood pressure throughout her prenatal care. She was in labor 40 hours. She had a generally contracted, flat pelvis. The baby weighed 2800 grams and was delivered March 15 by low cervical cæsarean section. She developed a high temperature and on the ninth day a small amount of pus was discharged from the abdominal wound. The metabolic reading on March 1 was +49 and on March 31, 16 days after delivery, +36. This case is reported because of the high readings noted. These were undoubtedly due to the mild degree of temperature and the presence of infection.

Case No. 1337. Multipara. Reported in the seventh month of pregnancy. Nothing unusual was noted in her prenatal care. She went into labor spontaneously on December 18 and had a normal delivery left occipito-anterior. She developed a thrombophlebitis, the highest temperature being 99.6° F. On December 2 the metabolic reading was +6. On December 23, 4 days after delivery, it was +42. At that time she began to complain of pain in the leg. The increase in the metabolic rate was probably due to the infection.

One case in the series, No. 909, a multipara, reported in the second month of pregnancy. Throughout her prenatal care everything went along smoothly. She went into labor spontaneously and delivered, left occipito-anterior, after 7 hours. Her blood pressure was normal and the highest temperature 99.2° F. The metabolic reading on December 7 was −5. On December 25, 8 days after delivery, it was 0. Just why this patient should have shown such a peculiar metabolic rate is difficult to explain.

Two house cases were examined. Mrs. E. K. was sent in with a high blood pressure, 200–160. The metabolic reading, taken on January 16, 1922, showed +32. Labor was induced on the 17th and she delivered spontaneously left occipito-anterior, second metabolic test was made January 21, 4 days after delivery, with a rate of +10. Blood pressure on this day was 160–142. This patient made a splendid recovery. She and the baby left the hospital in good condition.

Mrs. F. K., primipara, entered the hospital with high blood pressure and pre-eclamptic symptoms. Labor was induced January 23 and twins delivered, the first one, left occipito-anterior, low forceps; and the second one, left sacro-anterior, with manual aid. She developed convulsions shortly before delivery was effected. Metabolic reading taken on January 16 with a blood pressure of 150–70.

Grouping these toxic cases we find the average metabolic reading before delivery is +21 and after delivery +14.5. The readings vary so in range that no reliable data can be deduced. In other words the metabolic reading gives no information regarding the degree of toxæmia. Just as marked a variation is seen in the normal case. Both cases in which infection was present showed a marked increase in metabolic rate after delivery. This does not add much to our knowledge, however.

Case No. 1268. Para-I. Reported in the third month of pregnancy, at which time it was noted that she had a chronic appendicitis but not severe enough to demand operation. Her prenatal care showed nothing unusual. Life was felt June 13, bringing delivery date to November 29. Her last period was February 26, bringing the delivery date to December 23; she did not go into labor. The patient was seen January 4, at which time the fœtal heart tones were normal and the child was not very large. On January 6 she was given castor oil and quinine and delivered spontaneously right occipito-anterior. The heart tones were noted throughout labor. At delivery it was found that the child's hands and feet were covered with large blebs. The heart was beating and the child made a feeble cry, but expired within 30 minutes. The metabolic reading taken on November 11 showed −1. Taken again on January 10, 4 days after delivery, it showed +7. Nothing was found on the autopsy to account for this child's condition. The maternal family history was negative.

Case No. 1295. Para-I. This patient was first seen in the sixth month of pregnancy, with a negative history. Wassermann was negative. Two weeks after her first appearance a near relative suddenly died and 2 days later the patient stated that she did not feel the baby. The author being

TABLE III.—METABOLISM TESTS IN PREGNANCY

Name		Age	Para	Blood pressure	Period tested	Rate	Remarks
SB.	Before	16	I	.....	7th mo.	+12	
	After			80–70–60	8th day	+25	
CT.	Before	27	I	.....	9th mo.	+15	
	After			110–85–70	3rd day	+20	
CA.	Before	25	II	110–70–60	9th mo.	+10	
	After			100–85–70	5th day	+26	
DE.	Before	29	III	105–60	9th mo.	+45	
	After			108–90–74	6th day	+20	
PL.	Before	26	I	100–80–60	9th mo.	+20	
	After			98–80–70	4th day	+ 4	
GF.	Before	23	II	115–80–60	9th mo.	+20	
	After			110–90–70	5th day	+10	
PE.	Before	24	I	118–95–86	9th mo.	+28	
	After			120–95–80	3rd day	+32	
KR.	Before	34	I	114–90	9th mo.	+50	
	After			100–80–76	5th day	+60	
LI.	Before	32	I	114–72	9th mo.	+28	
	After			110–90–72	3rd day	+15	
BT.	Before	30	III	120–108–80	9th mo.	+85	Very neurotic.
	After			110–85–70	4th day	+50	
BH.	Before	25	I	110–102–90	9th mo.	+38	
	After			105–82–70	6th day	+25	
GG.	Before	30	I	105–85–65	9th mo.	+50	Very neurotic.
	After			98–80–62	5th day	+ 8	
BR.	Before	26	I	108–80–65	9th mo.	+18	
	After			90–75–60	3rd day	+28	
HN.	Before	25	I	120–90–70	9th mo.	+88	
	After			110–85–70	4th day	+20	
KR.	Before	22	I	120–80–66	9th mo.	+50	
	After			110–85–70	12th day	+20	
LN.	Before	25	I	120–100–80	9th mo.	+22	
	After			110–85–50	5th day	+15	
WF.	Before	34	III	110–90–80	9th mo.	+22	
	After			107–92–80	6th day	+27	
MH.	Before	31	IV	110–94–88	9th mo.	+22	
	After			102–80–64	5th day	+26	
GN.	Before	22	II	110–90–82	9th mo.	+15	
	After			100–90–70	8th day	+20	
SA.	Before	31	IV	112–90–70	9th mo.	+50	
	After			102–86–68	4th day	+26	
CY.	Before	27	III	100–84–62	9th mo.	+17	
	After			98–80–72	1st day	+20	
KS.	Before	23	I	90–82–64	9th mo.	+20	
	After			100–80–70	5th day	+15	Cæsarean.

Name		Age	Para	Blood pressure	Period tested	Rate	Remarks
GE.	Before	40	II	108–90–78	9th mo.	+78	
	After			100–90–76	5th day	+18	
JS.	Before	28	IV	105–90–80	9th mo.	+35	Lues.
	After			125–104–90	7th day	+32	
GZ.	Before	21	I	120–82–70	9th mo.	+20	
	After			110–88–60	6th day	+20	
MN.	Before	26	II	138–100–86	9th mo.	+20	Twins.
	After			110–86–70	6th day	+ 5	
RL.	Before	36	IV	138–120–98	9th mo.	+ 5	
	After			120–108–90	6th day	+ 8	
KL.	Before	2.	I	120–102–94	9th mo.	+30	
	After			128–112–90	6th day	+32	
FN.	Before	27	I	118–90–80	9th mo.	+28	
	After			118–90–80	7th day	+20	
ZW.	Before	24	I	98–70–50	9th mo.	+22	
	After			98–70–50	5th day	+20	
KZ.	Before	29	I	124–112–98	9th mo.	+18	
	After			110–90–80	.....	+18	
MN.	Before	31	I	120–100–80	9th mo.	+20	
	After			130–110–90	7th day	+12	
PD.	Before	24	I	125–100–80	9th mo.	+23	
	After			102–80–70	5th day	+15	
NL.	Before	32	III	90–74–60	9th mo.	+40	Goiter and mitral regurgitation.
	After			90–75–54	5th day	+15	
TE.	Before	27	II	104–80–70	9th mo.	+15	
	After			108–86–70	6th day	+18	
FS.	Before	26	I	90–70–50	9th mo.	+28	
	After			108–90–80	3rd day	+27	
SS.	Before	40	II	124–120–60	3rd mo.	+ 8	Chronic nephritis, fibroids; hysterectomy.
	After			136–118–70	6th day	+25	
WI.	Before	24	I	100–90–64	9th mo.	+20	
	After			90–76–60	6th day	+20	
KN.	Before	30	I	130–106–85	6th mo.	+12	Toxæmia of pregnancy; macerated fœtus.
	After			158–80–70	5th day	+10	
HR.	Before	36	I	122–90–68	9th mo	+ 5	
	After			110–80–72	4th day	+18	
PL.	Before	26	I	120–94–80	9th mo.	+15	
LN.	After			110–90–96	6th day	+ 5	
	Before	32	I	.....	7th mo.	+35	Fœtus dead at time; metabolism tests made.
	After			106–80–60	8th day	+ 8	
HN.	Before	25	I	140–120–90	9th mo.	+15	
	After			116–80–70	4th day	+ 8	
EN.	Before	27	I	114–90–80	9th mo.	+20	
	After			124–110–80	3rd day	+ 8	

TABLE III.—METABOLISM TESTS IN PREGNANCY—CONTINUED

Name		Age	Para	Blood pressure	Period tested	Rate	Remarks
BT.	Before	24	II	100-90-82	9th mo.	+10	
	After			98-80-56	15th day	+20	
KD.	Before	30	II	140-100-90	9th mo.	+20	
	After			140-125-90	4th day	+22	
KN.	Before	21	I	100-80-62	9th mo.	+35	
	After			102-70-68	12th day	+15	
HC.	Before	26	III	102-84-70	9th mo.	+15	
	After			118-90-80	5th day	+ 6	
MR.	Before	24	I	126-98-82	9th mo.	+20	
	After			110-90-80	4th day	+15	
SE.	Before	23	I	118-90-80	9th mo.	+35	
	After			100-80-70	5th day	+ 8	
HL.	Before	28	III	140-120-80	9th mo.	+ 8	Toxæmia of pregnancy, pre-eclamptic.
	After			140-120-80	5th day	+18	
HL.	Before	33	II	130-110-80	9th mo.	+50	
	After			130-108-90	6th day	+52	
PS.	Before	29	III	120-90-70	9th mo.	+ 8	
	After			118-88-74	4th day	+ 7	
VN.	Before	29	II	112-96-80	9th mo.	+15	
	After			108-80-70	6th day	+11	
OK.	Before	23	I	108-80-60	9th mo.	− 1	
	After			112-80-74	5th day	+ 7	
EM.	Before	21	I	122-108-80	7½ mos.	+20	
	After			98-70-60	4th day	+10	
HJ.	Before	23	I	116-100-80	9th mo.	+31	
	After			100-80-70	4th day	0	
HN.	Before	23	I	120-100-80	9th mo.	+10	No after tests.
CR.	Before	23	I	120-90-74	9th mo.	+18	
	After			118-80-72	7th day	+ 6	
KN.	Before	34	I	130-95-80	9th mo.	+13	
	After			120-65-55	3rd day	+16	
SH.	Before	24	II	102-60-50	9th mo.	+ 6	
	After			112-80-70	6th day	+20	
LM.	Before	35	III	110-80-70	9th mo.	+ 8	No after tests.
BY.	Before	27	I	110-90-80	9th mo.	+18	
	After			118-85-72	5th day	+25	
KR.	Before	36	IV	118-80-70	9th mo.	+ 6	
	After			110-75-65	4th day	+42	
MS.	Before	25	II	135-80-70	9th mo.	− 5	
	After			118-80-70	8th day	0	
BD.	Before	29	III	98-70-60	9th mo.	+48	
	After			100-70-60	10th day	+20	

Name		Age	Para	Blood pressure	Period tested	Rate	Remarks
FR.	Before	25	I	120-82-70	9th mo.	+ 7	
	After			140-94-85	5th day	+18	
KY.	Before	28	V	200-180-160	8½ mos.	+32	Toxæmia of pregnancy; induction.
	After			160-152-142	4th day	+10	
HS.	Before	24	I	130-80-72	9th mo.	+16	
	After			125-85-75	3rd day	+25	
KH.	Before	20	I	158-96-82	9th mo.	+42	Induction eclampsia; twins.
	After			120-83-70	.....	+10	
SH.	Before	31	I	116-80-75	9th mo.	+37	
	After			130-90-85	7th day	+10	
SO.	Before	17	I	105-92-58	9th mo.	+22	
	After			100-70-60	6th day	+28	
GT.	Before	32	II	110-98-82	9th mo.	+21	
	After			100-72-64	8th day	+20	
ZN.	Before	27	II	112-70-60	9th mo.	+47	
	After			112-70-62	9th day	+27	
MD.	Before	16	I	90-64-58	9th mo.	+13	
	After			90-62-50	4th day	....	
WN.	Before	22	I	112-64-56	9th mo.	+20	
	After			100-70-60	9th day	+22	
DW.	Before	21	I	122-80-72	9th mo.	+33	
	After			130-100-92	8th day	+ 8	
RN.	Before	34	II	118-80-72	9th mo.	+33	
	After			108-70-62	5th day	+12	
NR.	Before	25	II	112-70-60	9th mo.	+17	
	After			110-68-55	10th day	+13	
DN.	Before	28	II	108-78-60	9th mo.	− 5	
	After			100-70-62	7th day	+15	
CE.	Before	26	I	116-70-60	9th mo.	+47	"Cold."
	After			112-70-60	6th day	+31	
RG.	Before	37	I	120-90-82	9th mo.	+49	Cæsarean.
	After			124-88-76	16th day	+36	
FN.	Before	26	I	128-90-84	9th mo.	+70	
	After			134-114-88	8th day	+30	
BN.	Before	36	II	100-74-64	9th mo.	+44	
	After			.....	6th day	+42	
LE.	Before	40	II	110-64-56	9th mo.	+55	
	After			114-78-70	6th day	+49	
TG.	Before	26	I	140-110-92	9th mo.	+60	
	After			116-90-74	10th day	+35	
BS.	Before	25	I	128-80-76	9th mo.	+45	
	After			.....	6th day	+20	

away on vacation she was examined by two physicians who declared the child was dead. As near as we could figure the child died about July 9. Her last menstrual period was December 10. Frequent examinations were made between July 21 and October 2, the date this patient went into spontaneous labor. At no time in this interval were heart tones noted. The child was markedly macerated and showed all the signs of having been dead for a considerable period. It was thought that the metabolic reading might throw some light on the subject of whether the child was dead or not. The reading taken on September 7, 2 months after the child had died, showed +35. Taken again October 10, 8 days after delivery, showed +8.

One patient, Mrs. J. N., had a large thyroid. The metabolic reading taken 2 days before delivery showed +40. Taken 5 days after delivery, showed +15.

One patient in the series was a luetic. The metabolic reading taken 1 month before delivery showed +20 and 6 days after delivery showed +20.

Baer reports a case in which the diagnosis of macerated fœtus was made in the thirty-sixth week. This patient's reading was +10 before delivery and +8 after delivery. A similar case in my series varies little from the average pregnant case, hence I am unable to agree with Baer's statement that the death of the fœtus in late pregnancy in a woman otherwise normal is detected by a drop in the metabolic rate.

CONCLUSIONS

From the findings in this series of cases the following conclusions may be reached:

1. There is an increase in the metabolic rate above normal in pregnant women. It has a wide variation, however. There is nothing approaching a constant.

2. The test is subject to many errors beyond the control of the technician. The mental attitude of pregnant women is not stable, therefore the readings are not always reliable. Many tests in the experiment were not included in the report because of the hysterical condition of the patient at one or both tests.

3. The results in toxic cases were so variable that no reliable information was obtained. We could lay down no rule to guide us in determining the degree of toxicity or recovery in a given case. Neither could we say from the reading that labor should or should not be induced.

4. The death of the fœtus cannot be predicted from the metabolic rate.

5. The test consumes considerable time, effort, expense, and patience far out of proportion to the value of the information obtained.

RECURRENCE OF THE BENIGN PROSTATE[1]

By W. A. BRYAN, M.D., F.A.C.S., Nashville, Tennessee

THE word "recurrence" is employed here with the same significance given to it when applied to malignant tumors and with full conviction that it is a misnomer in both instances. The word carries the idea of complete cessation or disappearance or removal, and in neither instance is this true. In malignancy recurrence signifies that the tumor is not entirely destroyed or removed, and that the unharmed vestiges continue their growth until the tumor mass reappears. It is the same with recurrent prostates. No tumor or prostate can recur after all the cellular structures of their respective masses have been destroyed. This is another way of saying that recurrence of either of these pathological conditions is unmistakable proof of their incomplete removal.

The word "benign" is employed to signify the clinically and microscopically benign prostate, excluding all hypertrophied prostates which show microscopic evidences of carcinoma in varying ratio the maximum of which is 14 per cent. There is too great a discrepancy between this maximum figure and the clinical course of prostates, operated upon and not operated upon, for the surgeon to accept it as having valuable practical significance. Still, if there is microscopic evidence of malignancy, the recurrence might be accounted for on this score. Hence the establishment of benign recurrence must rest upon unquestionable cases. If these so-called malignant prostates can be cured by prostatectomy, it would not be unreasonable to admit their recurrence just as that of benign growths, or, if one prefers, as growths showing the same inoffensive type of malignancy found in the original tumor, if indeed we are to admit that benign recurrence can take place.

Hypertrophy of the prostate is due to an overgrowth of connective tissue or of the glandular tissue or to an admixture of these two elements. The latter is the mixed form described by Kaufmann, and the enlargement of the gland may be universal or occupy only certain portions. This may be the right lobe or the left or middle lobe or any two of them. When the hypertrophy is of the glandular or the mixed type, numerous centers of growth of individual nodules may be found, and numerous masses of varying size, from a guinea hen's egg down to the limit of unaided vision. This can be easily demonstrated by the simple gross examination of a few removed prostates, and is occasionally an annoying feature of prostatectomy, necessitating the removal of the gland piecemeal. It readily appears therefore how easily one or more such smaller masses may be left *in situ* at operation. The investigation by Tandler and Zuckerkandl of this subject is of great interest, especially when we reflect upon the cocksureness with which we have led ourselves to believe that we were doing complete prostatectomies. These men have studied cases on whom "complete" prostatectomy had been done and concluded that no complete prostatectomy was ever done, claiming that the "capsule" which operators so religiously refrain from disturbing is not a capsule from the anatomical or histological point of view, but is the prostate gland itself, or the remaining structurally normal portion of it which has been distended and compressed by the pathological masses growing within it. Unless this work can be proven entirely untrustworthy, the wonder is that more recurrences are not discovered.

Etiology is of value in this connection and undoubtedly has direct bearing on the recurrence. If the cause, whatever it may be, acts once and ceases to produce stimulative influence on the growth when it has acted, there should be no continuation of growth of unremoved fragments after prostatectomy. If the cause is continuous or repeated, it may produce a hypertrophy in unremoved portions which have been left by the surgeon. Or if the cause acts unequally on the lobes, the stimulus on the less advanced lobes may con-

[1] Read before the Southern Surgical Association, December, 1921.

tinue to act after removal of the portions of the gland which had advanced far enough to produce symptoms. No doubt this enlargement of lesser remaining lobes may continue at a greater rate than had been possible before removal of the larger adjacent masses.

The failure of more numerous reports of recurrence rests, I believe, upon two causes:

First, that the patient who has had his prostate removed by a surgeon and has been relieved of his symptoms and later finds those same symptoms returning has a question raised in his mind as to the genuineness of the removal of the gland. He finally is compelled to consult his physician, who examines him and tells him that his prostate has never been removed, because it is still there, palpable and producing symptoms. This physician may be entirely honest; probably only a small percentage of the profession know of the fact of recurrence. The patient naturally feels unkindly toward the surgeon who claims to have removed a gland which is still present at its original site.

Second, that, when compulsion drives him, this patient is likely to seek relief at other hands. The second surgeon probably is human and feels perhaps that he is about the only man in the world capable of doing a prostatectomy. He also may prove uncharitable and think that the first operator removed only a portion of the gland, and concludes that the recurrence is simply the continued growth of gross portions left through ignorance or neglect.

The treatment of such cases by two men consecutively robs both of them of the possibility of arriving at the truth, because neither is in position to compare the facts in his possession with the facts in the possession of the other. It is only when the primary condition and the recurrence are treated by the same man that the truth can be reached.

I have seen three cases of recurrence. One of these had been operated on by another surgeon, and came to me some years afterward on account of symptoms indicating recurrence. This was early in my career, and, not knowing the truth about such cases, I assured him most sanguinely that his prostate had not been removed. This case is no proof of recurrence. Perhaps my statement that it had not been removed was correct.

The second case was a recurrence of symptoms 2 years after the patient had been operated on by a most competent member of this association, whose death occurred prior to the second operation. I do not believe he would have done an incomplete prostatectomy, knowingly, still he might have left the right lobe on account of its small size, or might have overlooked it. I removed it. It was benign. This case does not prove anything.

The third case, I operated upon myself, removing the right and left lobes and the intermediate lobe. Microscopic examination proved it to be benign. This operation was done in November, 1915, and was what I considered to be a complete prostatectomy. The patient made a satisfactory recovery, and was relieved of his prostatic symptoms. He moved to another city, and began to develop obstructive symptoms again 2 years ago. Another surgeon was consulted and the patient was informed that prostatic hypertrophy and stones were the cause of his distress. The stones were removed in April, 1920. At the end of the year 1920 his trouble returned, and the same surgeon operated again in January, 1921, finding that the passage was blocked by the continued enlargement of the prostate. He assured the patient and his wife that there was absolutely no gross evidence of cancer. This surgeon was probably correct in refusing to do a radical operation on account of a bad heart and high blood pressure, contenting himself with permanent suprapubic drainage. Some months ago the patient returned to Nashville. He presents evidence of a uniform enlargement of the prostate just as if it had never been removed. The mass is easily as large as a tangerine, and bears no clinical evidence of malignancy. The general condition of the man is good. His appearance and nutrition are good. He is annoyed by continued stone formation and by his cardiac symptoms. He does not give the impression of a cancer patient. This case, too, is not to be accepted as absolute proof that the recurrence is benign, but much more serious conclusions have been based on far less convincing circumstantial evidence.

It was admitted in the beginning of this discussion that there is no such thing as true recurrence of a removed pathological tissue, and that recurrence in tumor or prostate is conclusive proof that some of the original tissues had escaped and subsequently grown to cognizable proportions.

While it may be agreed that it is culpable to leave gross portions of a prostate, it must be admitted that there is weighty evidence that "complete" prostatectomies are not complete, and that there is unequivocal proof that benign recurrences have followed prostatectomy at the hands of very able men. The possibility of such an outcome imposes upon the surgeon the necessity of a little more thoroughness in this work, not with the hope of escaping recurrence altogether, but with the hope of cutting the percentage of recurrences to a minimum.

NECESSITY FOR CAUTION IN THE EMPLOYMENT OF HIGH VOLTAGE ROENTGEN-RAYS AS A THERAPEUTIC AGENT AGAINST MALIGNANT DISEASE: ACUTE ADRENAL INSUFFICIENCY AND DEATH AS SEQUELÆ

By FRANK SMITHIES, M.D., F.A.C.P., Chicago
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MANY physicians whose training and experience in the theory or the practical application of principles involved in therapeutic actinology has been most meager, are treating patients affected with malignancy by roentgen-rays developed by a modified Coolidge tube, subjected to an electric current of from 200,000 to the neighborhood of 300,000 volts. The prevalent enthusiasm for this type of attack upon neoplasmata, while laudable, is apt to lead clinicians astray, unless unusual care is exercised in the correct application of the technical principles of the procedure, and unbiased scrutiny of end-results is the rule. Not sufficient work has been carried forward concerning the effects of high voltage currents upon normal tissue to enable one to prognose what will happen when malignant cells of themselves or in normal tissue are exposed to such currents. Such researches should be conducted by properly supervised and disinterested institutions before extravagant therapeutic claims are made by actinologists.

Medical literature has carried very few, if any, criticisms upon or warnings against the "new roentgen therapy." Occasionally, amid the mass of reports relative to the effects of high voltage currents upon tumors, one detects a mild questioning of end-results, or a caution regarding post-treatment "reactions" (shock, anuria, psychic disturbances, anæmia, anorexia, accelerated tumor growth, early exitus, etc.). Chiefly, however, contributions are concerned with the gross effects of the therapy upon the neoplasm; they give scant attention to pathological changes in tissues apart from those in which tumors are situated or to the clinical phenomena observable in cancer hosts.

In the circumstances, it would seem opportune and proper to summarize a recently observed patient and to let the facts carry their own burden of warning. The details are given *seriatim* and at length in order to emphasize the nature of the affection and because this report is one of the early instances of "roentgen death" in the literature.

CASE REPORT

The patient, a prosperous Michigan furniture manufacturer, aged 58, was seen at his home in consultation with his family physician. Previous to his present ailment, he had been favored with an exceptionally sound constitution; he had never had an incapacitating illness, had been active, physically and mentally, in business, and more recently, in war relief work, and had been greatly admired for his "fitness" and youthful appearance.

The present illness dates back less than 5 months. While riding a favorite horse, he was thrown, not

violently; he came down "flat on his back." He was not particularly shaken up, but experienced a soreness of the back muscles, and was a bit bruised generally. After a few days, since the soreness persisted, he was persuaded to visit a roentgenologist of repute in a neighboring city for the purpose of getting some films of his spine; it was thought that possibly there had been a slight twist or partial dislocation. The films revealed a considerable degree of lipping of the vertebræ, thickening of the periosteum, but no fractures or dislocations; there was an indefinite degree of tenderness accompanied by a possible limitation of movement in the lower thoracic and upper lumbar sections of the spines. Inasmuch as in these areas, the vertebræ seemed somewhat mottled and irregular and the intervertebral discs less definite than normal, the opinion was given that there existed an early osteosarcoma. Roentgen therapy, with voltage in the neighborhood of 230,000, was advised and the suggestion accepted.

Three séances, lasting "several hours, at least," were given. So far as could be ascertained, one treatment was given, through and through, from the back, directly over the supposedly sarcomatous area, and two "cross fire" treatments, from the back, at an angle of about 60 degrees to the spine. The patient then returned home. No immediate ill effects followed the roentgen séances.

Within a month following the roentgen therapy, the patient began to experience unusual fatigue upon slight exertion. Spinal pain and soreness had disappeared, but languor, palpitation of the heart, attacks of dizziness and distress "through the bowels" were present. It was thought that overwork was responsible for the disability, so a month's vacation was suggested and promptly taken. However, the disturbance became aggravated, and shortly, anorexia, attacks of exhausting diarrhœa, nausea, "nervousness," weight loss, and insomnia were noted.

A specialist in disorders of digestion was next consulted. He reported "achylia gastrica, pancreatic insufficiency and intestinal indigestion." Treatment to attempt relief was instituted and thoroughly carried out. There were no beneficial effects. Weakness, mental sluggishness, prostrating diarrhœa, weight loss, attacks of abdominal pain, and "nervous restlessness" became more distressing. About this time, the family physician noted a definite change in the patient's skin color; it was of a tan or yellowish-brown shade, diffuse in distribution; it resembled a mild icterus, but the sclera remained clear. Inasmuch as the man had been in the open for 2 months, the color change was considered, for the time being, "sun-burn." However, the attending physician kept the patient under observation. Within another month, the color had deepened to a uniform light, bronze-brown; the systolic blood pressure was 80 millimeters mercury; the urine contained albumin and granular casts, the red blood-cell count was between 2,000,000 and 2,500,000 per cubic millimeter, there was a leucopænia and the hæmoglobin was 55 per cent.

Shortly afterward, prostration, tachycardia, and diarrhœa confined the patient to his bed; a certain mental confusion developed; a weight loss in excess of 25 pounds over a period of 2 months was recorded; feeding was extremely difficult due to nausea and vomiting; malignancy was feared—possibly, metastases from the "sarcoma" of the spine; the skin had assumed a definite brownish hue; there was slight œdema about both ankles.

Rather more than a week before it was my privilege to see the patient, it was decided to take him for diagnostic study to a well known clinic. By this time he was so feeble that a wheel chair was required. Examination at this clinic disclosed no spinal anomaly whatever, no evidences of malignancy in any part of his body, gastric and pancreatic achylia, severe degree of "secondary" type of anæmia, and "Addison's disease" was suspected. The patient returned to his home, and within a few days sank into coma.

My findings were as follows (1 a.m.): A much emaciated middle aged man, in restless, somewhat stertorous coma; pulse 156, respiration 38, temperature 101° F. The skin was dry, wrinkled and was an intense bronze-brown shade with a peculiar ash gray hue when looked at from an angle; the navel zone, the genitalia, and the axillæ were the color of ebony lightly dusted over with the ash of a good cigar. In but three zones was the skin light in color: posteriorly, from the eighth thoracic spine to the mid-lumbar spine, and on each side, from the scapular tips to the iliac crests, were three overlapping, roughly circular areas, well defined, and of a pale tan-yellow color. In these zones, the skin was tough, wrinkle-free, shiny and seemed somewhat shallowly pitted. These areas represented the region which had been subjected to roentgen therapy; they had been "burned," scars had formed, and in these scarred places—as is characteristic for "Addison's disease"—excessive deposition of pigment, as exhibited generally by this man's skin, had not occurred. Pigment changes were noticeably present on the hard and soft palates and the buccal mucous membrane.

Soft œdema extended in slight degree from the malleoli half way to the knees. Knee, elbow, cremasteric, plantar, and Oppenheim responses were absent or very sluggish. There was no Kernig's sign; the lax rectal sphincter permitted a constant dripping of fluid, somewhat frothy, but blood and pus-free, fæces. There had been no urinary incontinence; the kidney output was greatly reduced.

Pupils were equally dilated and but sluggishly responsive to light exhibition; the eye grounds were very pale and œdematous, the blood vessels and disc being barely delimitable. Pharyngeal reflex was present. There were no gland enlargements.

The lungs were clear except for a few persistent, fine, moist râles over both lower lobes.

The heart was in moderate dilatation, generally; the sounds were weak but regular; a soft, blowing,

systolic bruit was audible throughout the entire precordia. The radial pulse was barely detectable, but when felt was soft and small; the arteries exhibited but slight stiffening. The systolic pressure was 42, the diastolic 34 (3 separate readings, by auscultation). The pressure exhibited no recognizable differences when noted at left and right radials.

There was striking general abdominal distention—the marked contrast of a "full" belly in a patient otherwise but a skin-covered skeleton. The distention was seemingly an ileus of large and small guts and the stomach; the wall was soft, atonic, and returned a peculiar "doughy" feel. There was no demonstrable free peritoneal fluid; the bowel distension practically obliterated liver and spleen outlines. Neither kidney could be palpated and there was demonstrated no local tenderness or abnormal kidney outlines. Local, right upper quadrant and epigastric palpation returned negative information.

The spinal column was everywhere in normal alignment and over no area were there limitation of motion, abnormalities in contour, local tenderness, or other evidences of disease.

Rectal examination demonstrated no anomaly other than tremendous ileus of the rectum and sigmoid.

The hæmoglobin was 35 per cent; the red cell count not obtainable; the stained blood smear exhibited 42 per cent of lymphocytes and 56 per cent polynuclears; there were poikilocytosis, anisocytosis, polychromatophilia and deficient platelets; no erythroblasts were seen.

The urine was smoky brown and contained blood-derived pigment, albumin, and a few fine granular casts.

Epicrisis. Adrenalin and salt solution were given intravenously in heroic dose, the patient returned to partial consciousness and under such stimuli lived about 48 hours. Death ensued from exhaustion and cardiorenal failure.

RÉSUMÉ

Instances of "acute" or "fulminant" Addison's syndrome are rare; it is most unusual to have the disease appear after age 50 and *exitus* occur in less than a year. An instance of death from the Addisonian syndrome, within 4 months after "deep" roentgen therapy of long duration and very high voltage in a man aged 58 is recorded. The roentgen séances were given as curative measures for supposed malignancy of the spine (a diagnosis subsequently shown to have been faulty). It can scarcely be presumed that this patient's fall from his horse produced simultaneous acute, double-sided adrenal injury and failure. The man was very "fit" when he sustained what seemed to be nothing more than muscle bruises to his paraspinal group. He remained "fit," despite his slight muscular lameness, until a few weeks after roentgen exposures, and his collapse afterward was rapid.

The proximity of the adrenals to the areas treated by the high voltage X-rays for long time-intervals strongly suggests that this form of therapeusis was an agent responsible for the acute collapse of adrenal function and doubtless the destruction of chromaffin tissue. Unfortunately, autopsy was denied: the cause of the disability and death were, however, unmistakable.

NOTE.—It was through Dr. J. E. Meengs, of Grand Rapids, that I had opportunity of examining this patient.

RADIUM TREATMENT OF KELOIDS

BY ERNEST M. DALAND, M.D., BOSTON
From the Collis P. Huntington Memorial Hospital

A KELOID (cheloid) is an overgrowth of hyaline connective tissue in the skin or in a mass of scar tissue, with a complete destruction of the elastic fibers. Mallory (1) describes the microscopical appearance. "The fibroblasts of which they are composed are distributed in thin sheets between thick layers of collagen fibrils, which are more or less fused together and usually appear hyaline. The cells and fibrils run in various directions. The tissue resembles scar tissue."

Keloids usually develop as a result of trauma, but they may arise spontaneously. Clinically, a keloid appears as a tumor of the skin, but its color is decidedly pinker than normal skin, and it may even have a violet hue. It is raised and firm and usually has a

round, smooth crest. It is somewhat reduced in thickness by pressure, but does not entirely disappear. The keloidal tissue does not extend below the skin and is not deeply adherent. It may develop in scar tissue or around the periphery of the scar, tending to involve more and more of the scar as time goes on. Keloids never become malignant. Secondary changes and rapid growth are due to increased hyalinosis (2). Keloids were formerly considered to be of infectious or tuberculous origin.

Contrary to the usual idea, keloids cause besides cosmetic disfigurement considerable discomfort to the patient. The majority of patients seen in our clinic complained of pain, itching, or a "pulling sensation" in the growth.

Negroes are more susceptible to these lesions than others. However, in this series, this statement is not borne out. While it is said that in southern clinics the majority of patients presenting themselves for treatment are negroes, only two negroes were treated in our clinic. Thirty-three of the patients (57 per cent) were of American birth. The others were fairly evenly divided among the nationalities found in this locality. No one people seemed more susceptible, but we realize that our number of cases is too small to draw any conclusions as to racial susceptibility.

TABLE I.—NATIONALITY OF PATIENTS

	Cases
American	33
Italian	6
Russian	3
Armenian	3
Irish	2
Canadian	2
American negro	2
Belgian, Spanish, Syrian, Haitian, Cuban, Greek, each	1

Of the fifty-eight cases seen in the Huntington Hospital clinic, the exposed areas of the body were the most commonly affected. The lesions in more than one-half of the cases were on the neck or upper part of the chest. In women, that part of the chest above and between the breasts is a particularly common place for keloids to develop. However, keloids may appear anywhere on the cutaneous surfaces. The writer has seen several keloids in vaccination and laparotomy scars. Frequently they follow tuberculous glands which have been incised or which have ruptured spontaneously. In short, they may occur wherever there has been an operative wound or trauma to the skin. Wickham and Degrais (3) describe a very unusual case of keloid of the mucous membrane of the upper lip.

Thirty-six patients of the cases reviewed were females and twenty-two were males. From these figures females would seem to be more prone to develop keloids for males are certainly more exposed to trauma than females.

Keloids may occur at any age. In our series the majority was evenly divided between the second, third and fourth decades.

TABLE II.—AGE INCIDENCE

	Cases
0 to 10 years	8
10 to 20 years	12
20 to 30 years	13
30 to 40 years	13
40 to 50 years	8
50 to 60 years	3

It is a well-known fact that burns are the commonest form of trauma which produces keloids. Unfortunately, many of our records fail to state the type of burn, whether caused by fire, hot water, caustic, etc. Twenty-one cases were seen following burns. Operative scars were the next commonest cause. No particular type of operation predominated, although incisions on the neck or chest seemed to be the most likely to develop keloids. Eleven cases are classed as "spontaneous," as there was no known cause. Some of these were doubtless of acne origin, as frequently the patien stated that the lesion "began as a pimple."

TABLE III.—CAUSATIVE AGENT

		Cases
Spontaneous (no known cause)		11
Lacerations		7
Operative scars		14
Incisions for sepsis	6	
Excisions (glands, wens, etc.)	8	
Burns		21
Hot water	4	
Fire	2	
Caustic	2	
Hot water bottle	1	
Radiator	1	
Antiphlogistine	1	
Unspecified	10	
Tuberculous gland sinus		1
Acne vulgaris		1
No record		3

More than one-half of the cases were of less than 2 years' duration. Seven had existed for from 10 to 25 years.

TABLE IV.—DURATION OF KELOID

	Cases
1 year or less	20
1 to 2 years	12
3 years	4
4 years	2
5 years	4
5 to 10 years	11
10 to 15 years	1
15 to 20 years	2
20 to 25 years	1
Unknown	1

Twenty-two patients had been under treatment before appearing at our clinic. Operation was the chief means of treatment and several patients had been operated upon more than once. Five had received numerous X-ray treatments without improvement. One patient had been treated with radium without benefit. None had benefited from any form of treatment.

TABLE V.—PREVIOUS TREATMENT

	Cases
1 operative removal	14
2 operative removals	3
3 operative removals	1
X-ray	5
Freezing	1
Plaster	1
Acid	1
Ointment	2
Electricity	2
Radium	1
Excision and Thiersch Graft	1
Total	22

The tendency to develop keloids is frequently inherited. In one family there was a history of keloids in the patient's mother, brother, and sister. In another, a brother and a sister of the patient were said to have lesions of this type. Some people are very apt to develop a keloid every time their skin is traumatized, lacerated, or incised.

THE SEARCH FOR A SPECIFIC CURE FOR KELOIDS

Many types of therapy have been tried in the attempt to find a cure for keloidal growths. Excision has been attempted frequently, nearly always with the result that the growth recurred over a much larger area. Some operators have claimed that, if a keloid is removed without cutting into it, as if it were a malignant growth, it will not recur. Results do not verify this conclusion, however, and the method has been practically abandoned.

Smyth (4) reported a case of keloid of the ear, cured by the injection of formalin. Lesieur (5) injected oil of creosote, made by dissolving 10 grams of creosote in 150 grams of sterile olive oil. This resulted in a disappearance of the rose tint of the tumor and served to arrest growing keloids. A regrowth of the keloid never took place at the site of the needle point. Electrolysis with the galvanic current reduces the size of the growth and decreases the amount of pain, but does not entirely destroy the lesion. Ahlswede (6) used pepsin-hydrochloric acid to digest the collagenous tissue. He does not mention his results. Carbon dioxide snow has been used successfully in a few cases. Gougerot (7) injected an aqueous solution of fibrolysin subcutaneously. This was repeated every 2 days for 20 to 30 days. Some of his results were good. Vidal (8) has shown that deep scarifications performed repeatedly will produce good results. These treatments must be kept up for months and even years. Tousey (9) used thiosinamin, either in capsules or subcutaneously. He reported absorption of the keloids, together with a loss of the tendency to develop these lesions.

A new chapter in the treatment of these lesions was opened up with the appearance of light therapy. The first type used was the Finsen ray, which proved fairly effective in reducing the size of some keloids. It is painless and involves no ulceration, according to Gaucher (10).

The X-ray was still more of an advance. In skilled hands, with repeated treatments, many cases are cured. There are others which are very resistant. Knox (11), Gougerot (7) and Pfahler (12) describe the technique used. Lopez-Silvero (13) and others advise excision of the keloid, followed by X-ray treatment.

Radium has proved to be the best therapeutical agent thus far found. Wickham and Degrais did the first work along this line. They noted that radium has a specific action

TABLE VI.—TREATMENT ADVISED

	Cases
No. cases examined	58
Radium advised	54
Radium advised and given	48
Radium advised and not given	6
Radium not advised	2
Radium advised after excision but not given	2
Radium following excision at another hospital	1

on some keloids, destroying them by absorption. They reported a large number of cases without a single recurrence. It was the publication of these results that led us to start our series.

TREATMENT ADVISED IN OUR SERIES

Fifty-eight cases were seen at the Huntington Hospital during the period from January, 1914, to July, 1921. Radium treatment was advised in 54 cases. One patient had a keloid on his foot, with an extensive ulcer nearby. It was thought that treatment of the ulcer was more important than radiation of the keloid. In another case the keloid was very soft, and as it was of very recent origin, radium was not advised. The lesion subsequently disappeared without treatment. Excision, followed by radiation, was advised in one case, but the patient failed to return for radiation until the lesion had recurred. It was then successfully radiated. Excision in another case was done at another hospital with the intention of referring him back to us for radium. This patient died of scarlet fever following the operation. Six patients failed to return for radium after it was advised. Forty-eight were treated by radium alone.

Excision of a large keloid of the chin and neck, followed by a Thiersch graft, was done by a member of our staff at another hospital. The patient was immediately referred to us for a keloid developing around the periphery. This was destroyed after several treatments and has not recurred.

METHODS OF TREATMENT

Many different methods of treatment have been tried in the radiation of these lesions. Early in the series we were handicapped by having but a small amount of radium. Some of the early cases were treated with glass emanation tubes in 0.25 millimeter steel jackets and with 2 millimeters lead screening. In others the screening was 1 centimeter gauze, 1 centimeter air or 1 millimeter lead. In the two cases classed as "unsatisfactory" (Table VII) the screening used was 2 millimeters lead.

It has been interesting to note a fairly definite proportion between the age of a keloid and the amount of radiation required to eradicate it. It has also been noticeable that keloids in children respond more easily to treatment than do those in adults. The earliest case seen was the following.

CASE 1. M. B., 10 years, of American parentage, entered the hospital for the removal of a large congenital verruca of the neck. Excision was done on April 27, 1921. Convalescence was uneventful. On June 24, a beginning keloid was noticed along the entire scar. Radium treatments on June 24 and July 22 entirely destroyed the keloid. On the first date two emanation tubes of 35 millicuries each with 0.25 millimeter steel and 1 millimeter silver filtration were placed longitudinally and end-to-end on the keloid and allowed to remain 1 hour. This gave a dosage for each tube of 35 millicurie hours. On the second date a similar treatment was given over a different portion of the scar. The dosage on this occasion was 40 millicurie hours for each tube. Slight erythema developed from each treatment, but there was no ulceration. There was no recurrence at the end of 6 months. This same patient had a congenital verruca of her ear. This was treated with destructive doses of radium and has been nearly destroyed. Even with destructive, ulcerating doses, there has been no tendency to form keloids in the scar of the ear.

Another case treated entirely with silver filtration (γ radiation) follows:

CASE 2. H. M., 4 years, of American parentage, burned her neck with boiling water 7 months before admission to the hospital. An extensive scar formed, with secondary keloid. Four months later an operation was performed at another hospital for the purpose of loosening up the scar. Keloidal tissue immediately formed all over the scar, increasing the contracture. She was treated eight times with the same type of filtration described in Case 1. One or two tubes were used each time, with an average dosage of 44 millicurie hours. At the end of 9 months the keloid was destroyed and the scar white. The underlying scar tissue was softened, making the contracture scarcely noticeable.

The case illustrates the close relationship between scar tissue and keloid. Scar tissue may be softened by radiation, but it does not

respond to radiation as well as does pure keloid tissue. In some cases it is difficult to determine whether one is dealing entirely with scar or whether there is a keloidal element present.

We have found that it is usually necessary to use less filtration than that used in the two cases reported. Patients who have had keloids for several years require β-radiation in addition to γ. β-radiation produces an ulceration and destroys the pigment layer of the skin, already badly damaged. This results in a white scar which eventually becomes somewhat pink, but it never returns to the color of normal skin. In people with dark skin this makes a very noticeable scar. However, we have found that most of the patients would rather have an ulcerative treatment, and thus secure quicker results, than to have the silver filtration. It must be explained in advance that there will be some local discomfort if this type of treatment is given. The majority of our adult cases have been treated with the steel-jacketed tubes, either laid directly on the lesion or raised on 2 to 5 millimeters of gauze. The average dose per tube has been 15 millicurie hours, and the average number of treatments, six. No two cases require exactly the same dosage. In some, 10 millicurie hours produced very little reaction, while in others, 30 millicurie hours produced but slight redness. Occasionally 0.5 millimeter silver has been used where the unfiltered tube has caused excessive reaction in previous applications.

CASE 3. C. B., 25 years, an American school teacher with multiple keloids on her shoulders, chest, and back was referred to me by Dr. C. J. White. The condition began as acne vulgaris and had been present 10 years. On May 7, 1921, she received a treatment of 92 millicurie hours with 0.25 millimeter steel, 0.5 millimeter silver and 1 centimeter gauze filtration over one area. There was no result. On June 3, a dosage of 63 millicurie hours was given over the same area with no result. On July 9, a dosage of 60 millicurie hours was given with 0.25 millimeters steel and 1 centimeter gauze filtration but no silver. There was slight softening but no erythema. A dosage of 30 millicurie hours more was given on July 20 and slight ulceration resulted. Another area was treated at intervals of about one month with 50 millicurie hours and 72 millicurie hours (0.25 millimeters steel, 0.5 millimeters silver and 0.5 centimeters gauze), without result. Three weeks later 65 millicurie hours without screening produced a deep ulceration. A third area was treated with 38 millicurie hours (unscreened) and resulted in erythema and ulceration. Other areas were then treated without filtration. It was found that the same dosage caused ulceration in some lesions and had no effect on others. This case is still under treatment. All the ulcers have healed, leaving flat, smooth scars, free from pain.

TABLE VII.—RESULTS OF RADIUM TREATMENT

	Cases
Cases treated	48
Cases still under treatment	10
Keloid destroyed	26
Insufficient number of treatments	3
Greater amount of keloid destroyed	4
Original keloid destroyed but new one appearing nearby	2
Some keloids destroyed, others untreated	1
Unsatisfactory	2
Recurrences	0

RADIUM TREATMENT IN OTHER CLINICS

The problem whether to treat a given keloid by absorption doses or destructive doses has been a difficult one. Wickham and Degrais recognize the need of two types of treatment. They use frequent treatments of short duration in the early lesions or those in children and expect to cause a slight inflammatory reaction. In the old keloids in adults they use some unscreened tubes to effect a destructive action and others heavily screened to produce a "selective action."

Simpson (14) uses "selective" doses in children and gets a slight inflammatory reaction. In keloids mixed with scar tissue he uses destructive doses. Knox treats the entire keloid and the adjacent tissues to the point of superficial redness. Taft (15) has found that X-rays are effective but that radium is better. He avoids doses causing a reaction and covers his filter with rubber or chamois to avoid telangiectases. He believes that ulcerating doses are apt to cause a recurrence. Taussig (16) believes that all but the oldest keloids may be destroyed by radium.

Tousey advocates a dosage of 20 milligrams of radium salt, with a filter of 0.3 millimeters glass and 0.5 aluminum, for 20 minutes or more on each portion of the lesion. The applicators are covered with rubber. Pinch (17) of the London Radium Institute uses a "half strength" applicator, screened

with 1 millimeter silver. He makes three exposures of from 4 to 6 hours' duration on each of three successive days, then repeats the entire treatment every 2 months until the lesions have disappeared.

Jeanselme (8) advises radium treatment after deep scarification of the lesion. Pfahler reports good results by excision followed by either X-ray or radium. Rostaine (18) cites a case which recurred four times after excision but which did not recur after excision followed by radium therapy.

RESULTS

Ten of our forty-eight cases are still under treatment. Of the others, twenty-six have had a complete destruction of their lesions. Three patients ceased treatment before a sufficient number of applications had been made. Two cases were unsatisfactory, as the keloids, of long duration, were treated with too heavy filtration. There have been no recurrences, either in the cases treated by absorption doses or in those treated by actual destruction of the lesion. Two patients developed new keloids near the old ones.

Every case treated was benefited. The first evidence of relief was the development of a certain amount of anæsthesia in the lesion. Later there was a disappearance of the itching and pulling sensation. Finally there was a softening of the scar. There was less variation from the normal color of the skin in the cases treated with absorption doses. In a few of the cases treated with ulcerating doses telangiectasis followed, but this was by no means always true.

There was no evidence to show that the tendency of a given individual to develop these lesions was influenced by the treatment of any one lesion by radium.

CONCLUSIONS

1. It seems probable that every keloid can be destroyed by radium if a sufficient dose is used.

2. Silver filtration (1 millimeter) should be used in keloids of recent origin, in children, in people of dark complexion and in exposed areas, as the face. The dosage should be from 30 to 60 millicurie hours, according to the age of the patients.

3. Practically unfiltered tubes should be used on all other keloids. The dosage should be from 15 to 30 millicurie hours per tube. It should be explained to patient that ulceration will result from this type of treatment.

4. There is no evidence to show that the destructive doses damage the tissues so that the lesions recur. There is no lessening of the tendency of an individual to develop keloids.

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THE BLOOD SUPPLY OF THE THYROID GLAND AND ITS SURGICAL SIGNIFICANCE[1]

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In order to ascertain to what extent the blood supply of the thyroid gland is affected by ligations, it seemed advisable to study the various possible anastomoses. A detailed study of the blood supply was made by injecting the blood vessels of twenty-five necropsy specimens (after the method of Gross) with a barium-carmin-gelatin mixture, which was heated on a water bath to a temperature of about 60° C. The injections were made with a 10 cubic centimeter syringe under enough pressure to fill the capillaries. While the inferior thyroid artery was being injected, the solution ran out of the superior thyroid of the same side in all of the cases, out of the superior thyroid of the opposite side in 30 per cent of the cases, and out of the superior thyroids of both sides and the opposite inferior thyroid in 20 per cent. When the primary injection into the superior thyroid artery was made, the injected material could be seen in the inferior thyroid of the same side in all cases, in the superior thyroid of the opposite side in 80 per cent of the cases, and in all the vessels in 20 per cent of the cases. Various combinations of injections were used and roentgenograms were made after each injection. Later, the specimens were fixed in kaiserling and dissected. The best results were obtained by studying normal thyroids or small colloid goiters. The exophthalmic goiters were difficult to inject and the vessels did not show up well.

The principal arterial trunks ramified on the surface of the gland within the true capsule and anastomosed freely with one another. Anastomosis was freer between the various vessels of the same side than between those of opposite sides, although there was a well-marked branch of communication through the isthmus.

The larger arteries were distributed principally over the surface of the gland; there was only an occasional large vessel deep in the parenchyma. Each artery gave off several branches, some of which supplied the anterior surface of the gland and some the posterior. The main continuations of these arteries most commonly ran along and on the margins of the gland (Figs. 1 and 2).

The superior thyroid artery was more constant in division and distribution than the inferior thyroid artery. It generally divided into three branches. The largest branch ran downward over the anterior surface of the gland, sending branches in all directions; some of these ramified over the surface of the gland, some supplied the parenchyma of the gland, others anastomosed with the superior thyroid of the opposite side, and still others, with the inferior of the same side. The next largest branch descended along the posterior border of the gland and anastomosed with the inferior thyroid, sending branches to the parenchyma of the gland and to the trachea. Often a common trunk was formed by this anastomosis, and gave off a terminal artery which supplied the superior parathyroid body. The third branch entered the substance of the gland and with the other parenchymal branches, as shown by Major, rapidly divided and formed a network of vessels supplying the lobules (Fig. 3).

The inferior thyroid artery divided into two or more branches at varying distances from the gland. Latarjet and Alamartine report instances in which the division occurred quite close to the thyroid axis, and one case in which was a double inferior thyroid artery. Dwight reports an absence of the inferior thyroid artery on the right in one case and on the left in five cases in a series of 437. The principal branches of this artery entered the capsule of the gland on the posterior surface in the neighborhood of the middle third. A few of these branches ramified over the surface of the gland, while one large branch ran along the inferior border toward the isthmus. The number of branches and the points at which they enter the gland may vary considerably.

[1] Abridgment of thesis submitted to the Faculty of the Graduate School of the University of Minnesota in partial fulfillment of the requirements for the degree of Master of Science in Surgery, April, 1922.

Fig. 1.

Fig. 1. Anterior view of a dissected thyroid gland injected with a carmin-gelatin-bismuth preparation showing: *a*, longitudinal anastomosis between inferior and superior thyroid arteries of the left side and *b*, complex anastomosis between both superior thyroid arteries and the inferior thyroid artery of the left side.

Fig. 2.

Fig. 2. Posterolateral view of a dissected thyroid injected with a carmin-gelatin-bismuth preparation. *a*, Blood vessel; *b*, recurrent laryngeal nerves; and *c*, parathyroids.

Fig. 3.

Fig. 3. Roentgenogram of normal thyroid after injection of all four thyroid vessels with a carmin-gelatin-bismuth preparation showing complex anastomosis at isthmus at *a*.

In the cases studied, the average point at which the principal branch of the inferior thyroid artery entered the capsule of the gland was 4.5 centimeters from the superior pole, and 1.8 centimeters from the inferior pole; the length of the lobe averaged 6.34 centimeters. In one case the uppermost branch entered the capsule 1 centimeter from the superior pole. In another case the lowest branch entered the capsule 0.25 centimeter from the inferior pole. The inferior thyroid artery was about one-third larger than the superior thyroid artery. The average inferior thyroid vessel measured 2.78 millimeters; the average superior thyroid artery measured 1.87 millimeters; the largest inferior was 3.68 millimeters; the smallest was 1.90 millimeters. The largest superior thyroid artery measured 2.38 millimeters, and the smallest 1.57 millimeters. In some instances definite arteries ran through the tracheal rings and entered the posterior surface of the gland; in others, branches from the inferior thyroid left the substance of the gland and entered the trachea on its anterolateral surface.

The microscopic blood vessels supplying the thyroid tissue were usually plentiful. The interlobular arteries, which are branches of the parenchymal vessels, were usually two to five in number and broke up into close networks that surrounded the follicles and lay immediately beneath the epithelium (Figs. 4, 5, 6, and 7).

Berard and Destol showed that the anastomoses were on the surface of the gland, and that few, if any, were intraglandular. Latarjet and Alamartine came to similar conclusions in their experiments. The most important anastomosis found in my experiments was the unilateral longitudinal anastomosis between the superior and inferior arteries of the same side. This anastomosis occurred on the lateral and posterior surfaces and occasionally just within the substance of the gland. Of these,

Fig. 4.

Fig. 5.

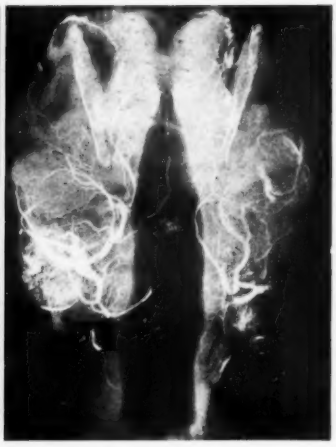

Fig. 6.

Fig. 4. Roentgenogram of right inferior thyroid artery injected with a carmin-gelatin-bismuth preparation.

Fig. 5. Roentgenogram of right inferior and right superior thyroid arteries injected with a carmin-gelatin-bismuth.

Fig. 6. Roentgenogram showing result of injection of the right superior thyroid artery and both inferior thyroid arteries with a carmin-gelatin-bismuth preparation.

the one on the lateral surface was seen most often. One of the branches that united the inferior and superior thyroid arteries most constantly lay in the angle formed by the trachea and œsophagus, and extended along the posterior border of the gland (Fig. 8).

The bilateral anastomoses were, as a rule, less developed, more complex, and extremely varied. Often there was direct communication between the superior thyroid vessels across the upper border of the isthmus, generally anteriorly, but at times posteriorly. Landstroem and Streckeisen have shown very clearly that such anastomoses are present on the surface of the gland, not only between the arteries of the same side, but also between those of opposite sides. Delore and Alamartine reached similar conclusions in a large series of injections. In this study no direct anastomosis was noted between the two inferior thyroid arteries (Fig. 9).

There was an indirect anastomosis by way of the larynx, trachea, and œsophagus, by which the blood supply to the thyroid gland could be re-established after ligation of all four arteries. The larynx was supplied by the superior laryngeal and cricothyroid arteries which are branches of the superior thyroid artery, and by the inferior laryngeal artery, a branch of the inferior thyroid. The trachea obtained its blood supply from branches of the inferior laryngeal and inferior thyroid arteries, which anastomosed below with bronchial arteries and with the internal mammary arteries through the anterior mediastinal twigs. Branches of inferior thyroid artery supplied œsophagus and anastomosed with lower branches of ascending pharyngeal artery (Fig. 10).

As a rule, the arteries in the substance of the thyroid gland were accompanied by two veins which were joined at various places by bar-like connections which crossed the arteries. The veins arose from the far side of the capillary network, followed the course of the arteries fairly closely, and anastomosed in a similar manner. They emptied at various places into the larger veins that emerged from the interior of the gland and anastomosed freely on the surface.

On examining the cut surface of injected glands it was observed that the individual vessels were larger in cases of colloid goiters than in cases of exophthalmic, and that the farther away from the capsule the sections were taken, the smaller the vessels. No one questions the vascularity of an active exoph-

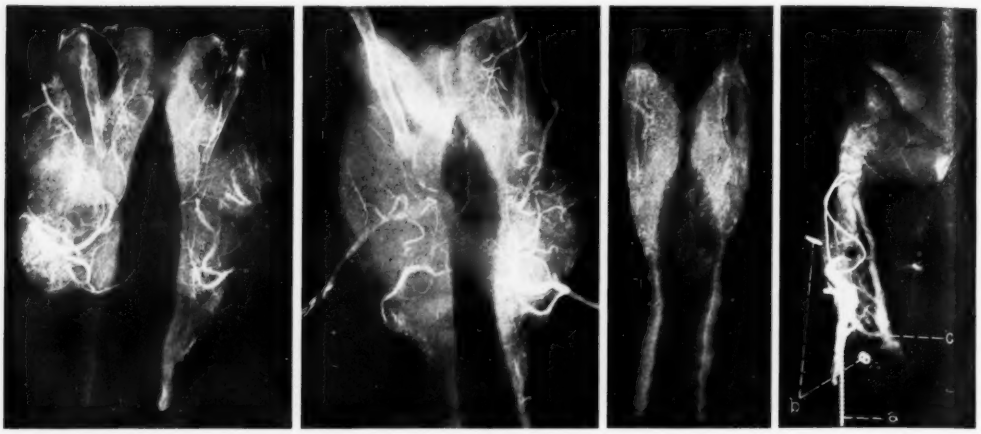

Fig. 7. Fig. 8. Fig. 9. Fig. 10.

Fig. 7. Result of injection of all four thyroid arteries.
Fig. 8. Result of injection of right inferior thyroid artery showing a very extensive anastomosis.
Fig. 9. Roentgenogram of trachea after all thyroid vessels had been injected with a carmin-gelatin-bismuth.
Fig. 10. Roentgenogram showing relation of: *a*, the recurrent laryngeal nerve and *b*, the parathyroids to *c*, the blood supply of the thyroid. Lateral view of a thyroid cut in two. Wire was laid along the nerve and metal tags were placed over the parathyroids.

thalmic goiter. This seeming contradiction is explained, therefore, by the fact that the lobules and follicles in the exophthalmic goiter are smaller but much more numerous within a given area and, as each has its individual blood supply, the vessels must, of necessity, break up into numerous smaller arterioles and capillaries in order to supply their lobules. In a colloid goiter the vessels in the parenchyma are larger and do not break down into so many minute capillaries as they do in exophthalmic goiter. The colloid is not distributed uniformly throughout the gland, but is in excess and under considerable pressure in various areas. The intralobular vessels are pressed on by this colloid to such extent that the lumina of the vessels are entirely obliterated, and the injected material is unable to penetrate them. This observation has been proved histologically by Wilson.

It is not understood just why patients with exophthalmic goiter are benefited by ligation of the superior thyroid arteries. If ligation should completely exclude the blood from the area supplied by the ligated vessel, necrosis would result. We know that it does not, for experiments show that the anastomosis is so rich that circulation can be re-established in a short time. Recently, thyroidectomy was performed at the Mayo Clinic about 2 weeks after all four vessels had been ligated, and little or no difference was noted in the vascularity of the gland (Figs. 11 and 12).

It would appear that some factor other than the blood supply must be responsible for the improvement after ligation. In experiments by Cannon, Binger, and Fitz, unmistakable signs of hyperthyroidism were produced in cats by anastomosing the vagus trunk into the superior cervical sympathetic. We can well assume, therefore, that the functional activity of the thyroid is controlled by sympathetic fibers. Ligation of the superior thyroid poles brings about an interruption of the impulses reaching the gland from the superior cervical sympathetic ganglion, since the branches from this ganglion reach the gland in company with the superior thyroid artery, and are ligated with these vessels. Thirty specimens, including segments of the superior thyroid artery and vein, removed during ligation and from necropsy specimens, were studied microscopically. Many small nerve bundles were seen to be closely associated with the vessels; others were embedded in the connective tissue. In several gros-

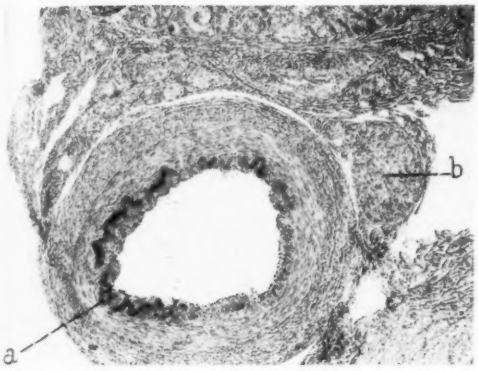

Fig. 11. Section from a normal thyroid showing: *a*, the superior thyroid artery and *b*, the accompanying nerves (x 40).

Fig. 12. Section from an exophthalmic goiter showing: *a*, superior thyroid artery and, *b*, large amount of nerve tissue surrounding the artery (x 50).

specimens a small nerve was dissected out and found to follow the course of the superior thyroid artery; it gave off minute branches and entered the gland with the artery. A few microscopic branches not closely associated with superior thyroid artery are found in the loose connective tissue at superior pole; these enter the gland independently of any vessels.

It would appear that in order to get the maximal benefit from ligations of the superior vessels, a polar ligation should be made in addition to dividing and ligating the superior thyroid artery; this would catch the veins, lymphatics, and remaining nerve filaments. Polar ligations alone, do not suffice, for there is no constant point where the superior thyroid artery enters the gland. We have seen patients in whom the superior pole has been ligated, but the artery missed. Pemberton has seen patients whose superior thyroid arteries did not enter the superior pole, but passed directly to the isthmus. In one specimen examined, the principal branch of the superior thyroid passed directly to isthmus, anastomosing with a branch from opposite superior.

The improvement which follows superior ligations is not seen following inferior ligations in spite of the fact that the inferior thyroid artery supplies a much larger area than the superior. This may be explained by the fact that there are only a few microscopic nerve filaments accompanying the inferior thyroid vessels. Another factor that may be of importance, if we assume that the activating material passes from the gland by way of its lymphatics, is that the superior lymphatics leave the gland in company with the superior artery and veins, and are ligated at the same time, whereas no veins or lymphatics accompany the inferior thyroid arteries.

Plummer has noted a drop in the basal metabolic rate in patients who have passed through recent crises, some intercurrent infection, such as tonsillitis, or anything that has caused a reaction. We have noted that the patients who have the sharpest reactions after ligation often show the most improvement when they return in 3 months for thyroidectomy. Neuhof was unable to show uniform changes following experimental ligation of the thyroid arteries and veins in dogs.

The inferior thyroid artery plays such an important part in the mechanism of production and in the surgery of substernal and intrathoracic goiter, that it is worthy of consideration here. The inferior artery ascends in the neck behind the carotid sheath, emerging from between the layers of the prevertebral fascia only a short distance before it enters the capsule on the posterior surface of the gland. This affords a good anchorage for the lower portion of the lobe. Below this point there is considerable gland without any inferior attachment, save the inferior thyroid veins, and they give little or no support. An adenoma developing in this area will follow the line of

least resistance, and hence grow downward between the middle and prevertebral layers of the deep cervical fascia, into the mediastinum. In removing such a gland it is important to begin at the superior pole and work downward, dividing the inferior thyroid artery close to the gland before attempting removal, and thus avoiding serious hæmorrhage. The control of hæmorrhage in surgery of the thyroid, especially exophthalmic goiter, is still of serious importance.

Velpeau, Kocher, deQuervain, Jones, and others routinely dislocate the gland inward and ligate the inferior thyroid arteries and then the superior vessels before starting the thyroidectomy. The objections to this procedure are the possibility of injury to the recurrent laryngeal nerve, and occasional tetany.

Certain surgeons place hæmostats around the lobe with a tight rubber band beneath them, and cut the gland across above the hæmostats, suturing the cut surface. Helgenberg recommends suturing the sternothyroid muscle or pieces of the sternocleidomastoid muscle to the bleeding surface of the remnant of the thyroid gland.

The running, over-and-over sutures, lock sutures, continuous mattress sutures, and interrupted mattress sutures have all been used, the last-named being the most satisfactory. Murphy has often said that great care should be taken to see that every vessel is found, clamped, and ligated in order to insure hæmostasis. After operation the patient should be made to cough or strain. This will cause bleeding from any veins that have collapsed and have not been ligated. Finally, the wound should be packed with gauze if there is any doubt about the hæmostasis.

Postoperative hæmorrhage is no longer a common occurrence. If it does occur, it comes on from a few hours to 72 hours after operation and is generally from an inferior thyroid vein or from a branch of the inferior thyroid artery. Often no definite bleeding point can be found. Hæmorrhage after the third day is extremely rare and is always due to infection.

CONCLUSIONS

1. The thyroid has a very rich arterial and venous blood supply.

2. There is an extensive anastomosis not only between vessels of the same lobe, but also with those of the opposite lobe.

3. In the event of ligation of all four thyroid vessels the circulation can be re-established through extraglandular anastomosis.

4. The secretory activity of the thyroid gland is under nerve control.

5. After ligation of the superior thyroid artery a polar ligation should be made in order to cut off the veins, lymphatics, and remaining nerve filaments.

6. Control of hæmorrhage is best accomplished by interrupted mattress sutures placed through the remaining gland tissue, by ligation of all bleeding points, and by the use of gauze packing in the wound if necessary.

7. Bleeding veins can often be demonstrated by having the patient strain or cough before the wound is closed.

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HISTOLOGICAL STUDY OF THE EFFECT OF LIGATION OF THE THYROID VESSELS IN EXOPHTHALMIC GOITER[1]

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BOOTHBY demonstrated in a series of 55 cases that before treatment the average basal metabolic rate was +68 per cent and the body weight 52.3 kilograms and that following two ligations and at least 2 months' rest, the basal metabolic rate had dropped to +43 per cent and the weight had increased to 56.6 kilograms. In a series of 42 cases in which ligation was performed followed in a week or two by thyroidectomy, the basal metabolic rate before treatment was +60 per cent and 10 days after the ligation +39 per cent. Boothby's detailed study confirms the general opinion held at the Mayo Clinic that ligation is of distinct value in decreasing the intensity of the intoxication of exophthalmic goiter (12).

The present study on the histology of the thyroid gland was made for the purpose of determining, if possible, whether any consistent involution changes could be demonstrated following ligation and, if such changes were found, whether or not they could be correlated with the clinical course of the case between the date of ligation and the thyroidectomy. So far as we have been able to ascertain the literature does not contain similar studies, although Wilson made such studies on a small series of thyroids several years ago, but did not publish them (14).

The thyroid glands studied were obtained immediately after thyroidectomy and sections approximately 9 by 9 by 4 millimeters were cut with a sharp knife and fixed in 10 per cent formalin. Precautions were taken to obtain the sections from each pole at a point as near as possible to the entrance of the vessels into the gland. Other sections were taken from each lobe at a point midway between the superior and inferior thyroid arteries. After the sections had been fixed they were cut with a freezing microtome about 10 to 12 microns thick and stained with hæmatoxylin and eosin. The vessels of the glands had been ligated at one or more poles for from 5 days to 302 days before thyroidectomy. The portion of the gland away from the ligated pole served as a control. We also made sections for controls from fifty unligated hypertrophic parenchymatous thyroids in various stages of the disease.

In order fully to understand the changes that take place following ligation of one or more of the thyroid vessels, it is important to consider the possible collateral anastomosis. Usually four arteries, two superior and two inferior, and occasionally also an anomalous artery, the thyroidea ima, supply blood to the thyroid gland. The superior thyroid arteries arise from the external carotids and divide into two branches, the anterior and posterior rami. The posterior branch anastomoses with branches of the inferior thyroid and the ramifications of the superior thyroid from the opposite side. The inferior thyroid arteries arise from the thyroid axes, enter the gland from the sides, and break up into branches, which, for the most part, ramify on the posterior surface. The thyroidea ima, when present, usually arises from the innominate artery, follows the trachea upward, and enters the thyroid from below. Pettenkofer believes that there is a widespread collateral circulation of the thyroid gland. Briefly, he concludes that there is an anastomosis between the thyroid arteries and the arterial network surrounding the œsophagus and trachea, and between the thyroid arteries and the external maxillary, lingual, ascending pharyngeal, sternocleidomastoid, and cricothyroid arteries. Madlener quotes Enderlen and Hotz who found that, following the ligation of all the thyroid arteries, collateral circulation is established from the carotids, from the arteries

[1] Under the supervision of Dr. A. C. Broders, Section on Surgical Pathology, and Dr. W. M. Boothby, Section on Clinical Metabolism.

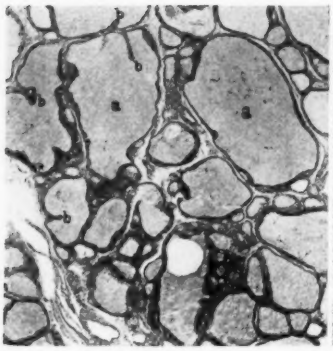

Fig. 1.

Fig. 2.

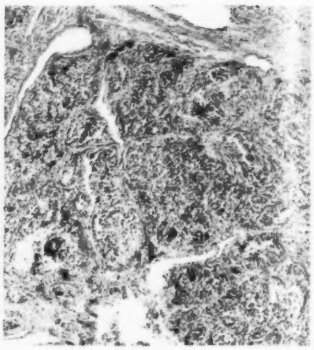

Fig. 3.

Fig. 1. Section taken from ligated pole 126 days after bipolar ligation. *a*. Predominance of large follicles lined with low cuboidal epithelium, and filled with colloid material *b*. Sprig-like processes projecting into lumina of follicles. (X37) (Case A346892.)

Fig. 2. Thrombosis of vessels near capsule with fibrosis surrounding them and invading the neighboring follicles 96 days after bipolar ligation. (X37) (Case A377393.)

Fig. 3. Marked increase of the follicular fibrous connective tissue with desquamation and pyknosis of the follicular epithelium, 93 days after bipolar ligation. (X37) (Case A343846.)

of the œsophagus and trachea, and even from the aorta.

The nerve filaments have been demonstrated by Mastin and others to accompany the superior thyroid vessels to the gland. The value of this observation is obvious in the light of the experiments of Cannon, Binger, and Fitz, who have shown that the superior sympathetic ganglia influence the activity of the thyroid gland. Wilson has histologically demonstrated degenerative changes in the cervical ganglia of patients with exophthalmic goiter and has produced experimentally, by inducing local infection in the cervical sympathetic ganglia of dogs and goats, changes in the thyroid gland which parallel changes in the various stages of progressive and regressive exophthalmic goiter.

The exact involution changes from active hyperplastic thyroids to quiescent are not definitely known. The increase in the size of the follicles with accumulation of colloid, the transition of the epithelium from high columnar to cuboidal, the desquamation of the epithelial cells, and the occurrence of large irregularly shaped cells have been regarded by various observers, notably Marine and Lenhart, and MacCallum, as criteria of involution. From our observations, as will be shown, these changes have been present in glands from patients in whom there was strong evidence that the activity of the thyroid was diminishing.

The 50 cases of this series are divided according to the type of ligation into: Group 1, 15 cases of unipolar ligation; Group 2, 20 cases of bipolar ligation; Group 3, 12 cases of tripolar ligation; and Group 4, 3 cases of quadripolar ligation.

We have carefully studied the histological picture of sections taken from the gland nearest the ligated vessels, noting particularly the size of the follicles, the type of epithelium lining them, and the amount of colloid present. The presence or absence of desquamation and pyknotic changes occurring in the nuclei, and the relative amount of intrafollicular fibrous connective tissue were noted. The changes found in the gland at the site of ligation were compared with those of the unligated portion. The frequency of involution change in the several groups studied is summarized in Table I.

The most constant finding of the early period in the sections taken near the ligated areas was a tendency for the lumina of the follicles to be large and filled with colloid. The majority of these were lined with low columnar or cuboidal epithelium. The relic of the infolding of the wall of the follicles was represented by "sprig-like" processes projecting into the lumen (Fig. 1). Careful search

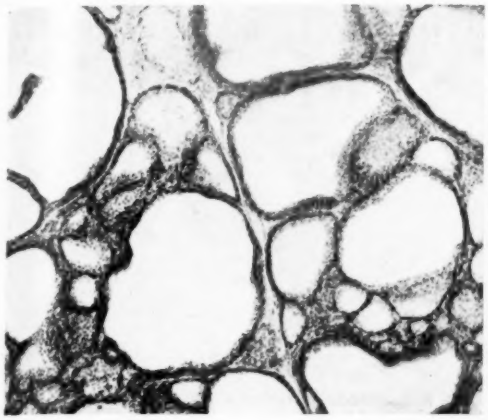

Fig. 4. Large follicles lined with cuboidal epithelium and sprig-like processes projecting into the lumen of a follicle, 5 days after unipolar ligation. (X50) (Case A350615.)

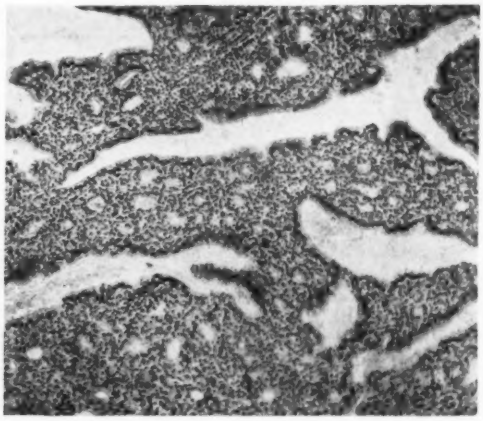

Fig. 5. High columnar epithelium lining the follicles of the unligated pole. Compare with Figure 4. (X50) (Case A350615.)

revealed that the portion of the gland far from the entrance of the ligated vessels was surprisingly free from these changes and apparently more active than the one near the entrance of the ligated vessels, as shown by the abundance of parenchymatous hypertrophy. The epithelium lining the follicles in the ligated portion apparently tended to become cuboidal and, later, in areas, there was desquamation of the lining cells. Occasionally there were large, irregular, granular, deep-staining, degenerative cells, described by MacCallum. In some of the late cases increase of the fibrous tissue stroma was the rule. This was most marked in the region of the capsule, near the thrombosed vessels, and extended into the neighboring parenchyma (Fig. 2). In a few cases this change was so extensive as well to deserve the name given by Marine "cirrhosis of the thyroid gland" (Fig. 3). Pyknotic changes in the nuclei were also present in this type of degeneration.

The involution changes described, except thrombosis, have been invariably present in various degrees in hypertrophic parenchymatous thyroids, the vessels of which were not ligated, but in no instance were these changes circumscribed to and accentuated in any limited portion of the gland, as often noted after ligation. The following reports of cases illustrate the involution changes found in the ligated pole as compared with those in the unligated pole.

REPORTS OF TYPICAL CASES

Case 1. Miss L. M. (A350615), age 16, with exophthalmic goiter, had a basal metabolic rate of +31 per cent February 25, 1921. March 4, the left superior thyroid vessels were ligated with silk. Five days later partial thyroidectomy was performed. The gland removed weighed 28 grams. The cut surface of the left upper pole of the gland near the entrance of the vessels was pale yellow to pink in

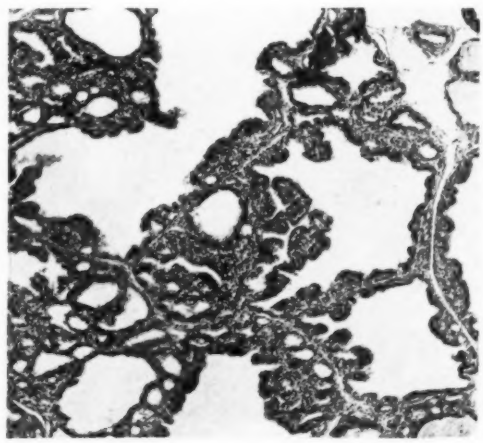

Fig. 6. Marked activity in the unligated pole; compare with Figure 1. (X50) (Case A346892.)

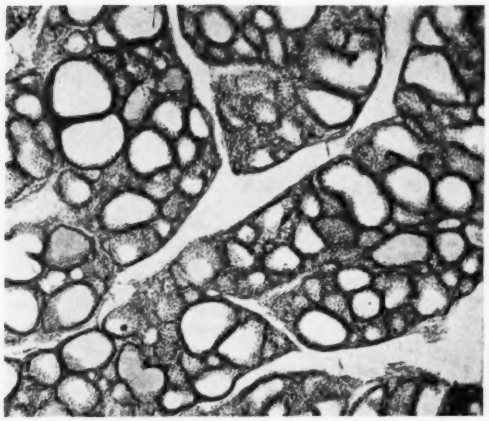

Fig. 7. Follicles lined with low cuboidal epithelium; remains of infolding processes represented by denuded sprigs; 168 days after bipolar ligation. (X50) (Case A208999.)

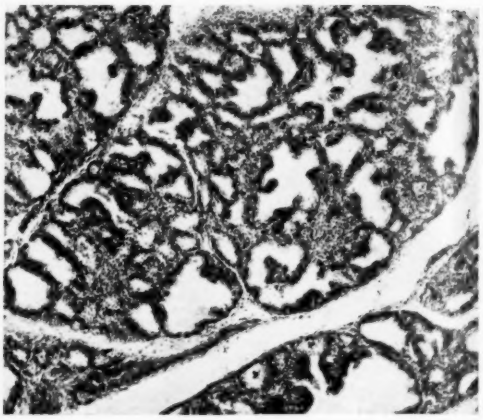

Fig. 8. Section from unligated pole, showing marked parenchymatous hypertrophy. Compare with Figure 7. (X50) (Case A208999.)

comparison to the flesh color elsewhere. Microscopic sections revealed the follicles of the gland near the ligated vessels to be distended with colloid material. The epithelium lining these follicles was cuboidal. Scattered throughout the section were many sprig-like processes projecting into the lumen, and follicles lined by high columnar epithelium were present in only a few areas. Sections taken from the other poles were more active, as shown by the predominance of the typical architecture of hypertrophic parenchymatous thyroid (Figs. 4 and 5).

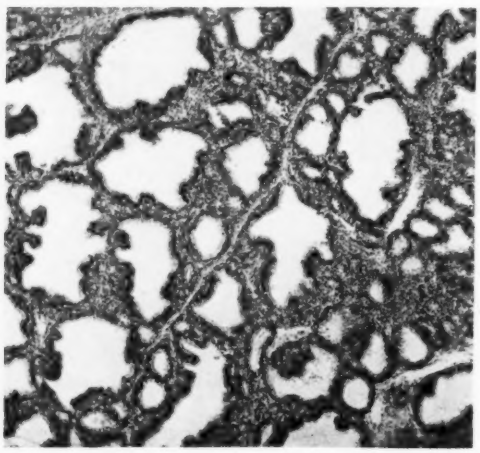

Fig. 9. Marked activity 221 days after quadripolar ligation. This is typical of the entire gland. (X50) (Case A346121.)

CASE 2. Mr. H. B. (A346892), age 38, with exophthalmic goiter, had a basal metabolic rate of +94 per cent January 21, 1921. January 25, the left superior thyroid vessels were ligated and February 1, the right superior vessels were ligated. May 27, the basal metabolic rate had decreased to +62 per cent and during the interval of 4 months' rest, the patient gained 15 pounds in weight, was stronger and clinically much improved. June 1, partial thyroidectomy was performed. The portion of gland removed weighed 90 grams. The cut surfaces of the superior poles were similar to the left superior pole described in Case 1. The sharp contrast between the ligated superior pole and the unligated inferior pole is shown in Figures 1 and 6.

CASE 3. Mrs. E. B. (A208999), age 55, with exophthalmic goiter, had a basal metabolic rate of +62 per cent September 23, 1921. Five days later the left superior thyroid vessels were ligated with silk. October 5, the right superior thyroid vessels were ligated. During the next 5 months the patient gained 9 pounds in weight, became less nervous and gained in strength. The basal metabolic rate decreased to +39 per cent March 10, 1922. A partial double thyroidectomy was performed March 16. The portion of the gland removed weighed 18 grams. The microscopic pictures illustrating the sharp contrast between the ligated superior pole and the unligated inferior pole in one lobe are shown in Figures 7 and 8.

CASE 4. Mrs. N. D. (A363068), age 64, with exophthalmic goiter, had a basal metabolic rate of +61 per cent August 4, 1921. August 9, the left superior thyroid vessels were ligated, and August 16, the right superior vessels were ligated. The patient was then sent home for a rest and returned 3 months later, November 17, not having gained in weight or

improved in general symptoms; the basal metabolic rate was +69 per cent. December 13, 5 cubic centimeters of hot water were injected in the right lobe of the thyroid gland. December 17, the basal metabolic rate was +56 per cent, and 3 days later the right inferior thyroid vessels were ligated. January 30, 1922, the basal metabolic rate was +59 per cent; there was no gain in weight; the following day partial thyroidectomy was performed. The portion of the gland removed weighed 65 grams. Histologically, it showed marked diffuse parenchymatous hypertrophy, as in Case 5 (Fig. 9), without any evidence of involution changes.

CASE 5. Mr. A. P. (A346121), age 44, with exophthalmic goiter, had a basal metabolic rate of +77 per cent January 13, 1921, which gradually increased to +86 per cent, February 7. February 15, and again 7 days later, 5 cubic centimeters of hot water were injected into the left lobe of the gland. The basal metabolic rate February 22 was +70 per cent. February 24, the left superior vessels were ligated. The patient returned to the Clinic the following July feeling better, although he had lost 14.5 pounds in weight during the interval. The basal metabolic rate was +84 per cent and the pulse rate 145. The patient was put to bed and roentgen-ray treatment was instituted. October 21, the basal metabolic rate was reduced to +58 per cent. The patient was sent home for further rest and returned the following December with a basal metabolic rate of +55 per cent and a gain of 26 pounds in weight. December 15, the right inferior and superior thyroid arteries were ligated and 11 days later both vessels on the opposite side were ligated. December 31 the basal metabolic rate was +39 per cent. The patient again went home and returned to the Clinic, February, 1922, much improved. The basal metabolic rates were +36 and +41 per cent February 28 and March 1, respectively; gain in weight was 29 pounds. March 2, bilateral partial thyroidectomy was performed. The portion of gland removed weighed 80 grams. Histologically, it showed marked diffuse parenchymatous hypertrophy (Fig. 9); definite histological involution changes could not be found.

Of the 50 cases of ligated hypertrophic parenchymatous thyroid studied in detail, definite involution changes were found in 33 (70 per cent), while sufficient distinguishing contrast between the ligated and unligated poles could not be demonstrated in the remaining 15. Definite involution changes were found in 10 (66 per cent) of the 15 cases of Group 1, in 14 (70 per cent) of the 20 cases of Group 2, and in 7 (46 per cent) of the 15 cases of Groups 3 and 4 combined.

In the 35 patients with definite involution changes in the ligated pole, 4 showed slight or questionable changes, and 15 showed no changes that could be attributed to ligation. No relationship between the time of ligation and that of partial thyroidectomy was demonstrable. A careful review of the clinical course of the disease following ligation disclosed that, on the whole, definite clinical improvement and a lowering of the basal metabolic rate occurred more often in cases in which definite involution changes were demonstrable in the ligated poles. On the other hand, 8 definite and a few other probable but indefinite exceptions occurred; in these cases there was no evidence of correlation between the clinical symptoms and the histological findings of involution changes. Our data do not indicate whether or not the involution changes noted following ligation of the vessels are attributable to the decrease in the blood supply or to the division of the sympathetic nerves accompanying these vessels.

TABLE I.—DEFINITE AND INDEFINITE CHANGES AFTER LIGATION

Type of Ligation	Cases	Involution changes		
		Marked	Slight	Indefinite
Unipolar	15	10	1	4
Bipolar	20	14	..	6
Tripolar	12	5	3	4
Quadripolar	3	2	..	1

In general, this study shows that distinct clinical improvement and lowering of the basal metabolic rate occurred more often in those cases in which definite involution changes in the ligated pole could be demonstrated histologically. On the other hand, a few definite exceptions demonstrated that a correlation between the clinical findings and the presence or absence of involution changes is not to be expected in all cases.

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HÆMORRHAGE FOLLOWING ABDOMINAL OPERATIONS

With Special Reference to Appendicectomy and Excluding Bleeding from the Stump

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ALTHOUGH there exists a fair amount of literature concerning gastro-intestinal hæmorrhage following abdominal operations, yet the number of actual cases, outside of hæmorrhage following gastro-enterostomy for duodenal ulcer, is small.

Intestinal hæmorrhage following an operation for hernia, especially a strangulated hernia, might be expected *a priori*, as the intestine is often seminecrotic and there are other morbid conditions. Luksch, in a statistical report published in 1898, found that there was about one enterorrhagia for every hundred operations for strangulated hernia. Sauvé was able to collect fourteen such cases from the literature, covering only a limited period.

But postoperative hæmatemesis following general abdominal operations is a very rare complication. The earliest cases reported seem to be those of Broca in 1864 and Le Fort in 1873. These cases did not, however, arouse much interest among surgeons. Schnitzler, Ullmann, and Kukula wrote important contributions to the literature of postoperative enterorrhagia, especially following hernia operations. Schnitzler called attention particularly to the immediate postoperative hæmorrhages and Ullmann to those occurring six months or later after operation. Kukula wrote on the importance of venous thrombosis in connection with the question.

The textbooks do not refer to postoperative gastric or intestinal hæmorrhage without any visible lesion and without apparent cause. In his oration on surgery delivered before the American Medical Association meeting at Atlantic City in 1900, Rodman described this condition. Rodman interrogated fifty leading surgeons and nine reported having observed cases of postoperative hæmatemesis. Finney, of Johns Hopkins, was not aware that a case had ever presented itself in the hospital of that institution up to that time. Robson had reported seven cases as occurring in his own practice, two of which were fatal, and von Eiselberg six cases, and three fatal cases by Reichard, in 1889. Johnston, of Richmond, had recorded five cases, three fatal, but accompanied by general peritonitis. Postoperative hæmatemesis has occurred after abdominal operations done upon the peritoneum, omentum, intestines, gall bladder, kidney, uterus, and ovaries. The disorder arises from the second to the tenth day subsequent to operation. Rodman regards sepsis as the

etiological factor. The sum total of all the hernia operations done by the fifty surgeons to whom Rodman had written must be many thousands, and yet but two cases of postoperative hæmatemesis are reported, and each was satisfactorily explained, one patient dying of peritonitis following strangulated hernia, the other from a duodenal ulcer demonstrated by autopsy. All of the cases seen by Robson and Eiselsberg followed intra-abdominal operations, such also being the case with all postoperative hæmatemeses reported by American surgeons, excepting two cases where nephrorraphy had been done. In doing nephrorraphy the peritoneum may, in the first place, be incautiously opened by the most careful operator, and secondly, there is always a considerable amount of traumatism necessary to force the kidney into the lumbar incision. It is not, therefore, difficult to understand how a hæmatoma may easily be produced by the great abdominal pressure oftentimes necessary to bring the kidneys into view, and how, furthermore, this extravasation may occasionally cause sapræmia, septicæmia, or peritonitis according to the circumstances. All septic conditions favor disintegration of the blood corpuscles and predispose to hæmorrhage from mucous surface. The gastric mucosa is particularly liable to congestion in conditions of sepsis, both on account of the marked tendency of the thin, and more or less disintegrated blood to settle in the internal organs, and the vomiting and retching so frequently present.

As hæmatemesis and enterorrhagia following general abdominal operations are therefore rare complications, it is only logical to deduce that cases of this nature following appendicectomy as a distinct class of abdominal operations, would be very few. I have recently observed a case of this kind which I describe below; and a fairly thorough search through the literature has revealed only 43 other cases which are described in the accompanying tabular statement. Many of these reports are meager and hence full particulars cannot be given.

The first case of hæmatemesis following appendicectomy was reported by Duckworth in 1889. Guy and Carlas reported a similar case in 1899. Since then I find that 43 cases have been reported.

Patient, female, age 16, student, athletically inclined. Patient holds several endurance records for swimming. Past illnesses and family history are not important. Menstruation began at 14, has been regular, of 28-day type, of 3 to 4 days' duration, and is not accompanied with pain.

Present illness began about 10 days prior to entrance to hospital, while she was at college. She was wakened from sleep by severe colic-like abdominal pains, followed by repeated attacks of nausea and vomiting—first stomach contents then bilious material. Temperature 100°. The attending physician made a diagnosis of acute appendicitis. Ice bags were applied and feeding suspended. The pain localized over McBurney's point in a few hours. After several days the symptoms subsided. Patient was confined to bed for a week, after which physician advised surgery and she was sent home, arriving at her parents' home February 3. She entered Washington Park Hospital 3 days later.

Physical examination on entrance revealed some local tenderness over appendix; slight tympany, temperature 99°, pulse 116, respiration 20. Leucocytes, 9,400; urine, negative; no previous gastric or duodenal history; chest, negative; heart, no valvular defects but slight tachycardia; no palpable thyroid or tremor.

Preliminary preparation. A soapsuds enema was given the evening before operation. Operation February 9, 1922. Gas anæsthesia, McBurney incision. The appendix was of the retrocæcal type, pointing upward. Old adhesions bound appendix to cæcum and postperitoneal wall. The tissues still showed marked infiltration and evidence of the recent inflammatory attack. Because of the limited space and the marked fixation of appendix I was compelled to enlarge the incision so as to deliver it satisfactorily. The mesentery was crushed with heavy forceps and ligated, the suture including the cæcal serosa.

The appendix stump was crushed and ligated. The stump was inverted with a purse-string suture of linen. Complete hæmostatis was maintained at all times. The abraded surface was covered with peritoneum with Lembert sutures. The bowel was returned and no bleeding followed. The wound was closed, and the patient awake before she left operating room. She was returned to bed with pulse of 100: she was warm, in good condition, and had an excellent day and night. On the evening of the second day about 10 p.m. she suddenly awakened from sleep, was very restless and excited. She had no pain, but her pulse was 142 and weak. Slight tympany was present. Percussion of stomach showed slight distention. Gastric lavage returned with some bile and mucus. A 1-2-3 enema expressed with large quantities of dark semi-fluid blood, followed later by repeated copious quantities of bright blood in the stool. The foot of the bed was

elevated, and 10 cubic centimeters thromboplastin administered intramuscularly. Red blood count taken at this time showed very slight change, 4,360,000. Pulse became more rapid, over 160, impossible to count. Air hunger became pronounced. More blood was found in stools. Progressive evidence of hæmorrhage was unexplained.

I felt that the possibility that the stump was the cause of the bleeding was just reason for re-opening the abdomen, which I did under gas anæsthesia, through a right rectus incision, in order to gain better vision. Inspection revealed a stump in excellent condition, with no evidence of hæmorrhage. The bowel blood content gave a dark bluish cast. The abdomen was closed. Ten minutes were required to make the examination. Patient was returned to bed, and the foot elevated. She was given large doses of morphine at frequent intervals; pulverized charcoal *ad lib.* was given per mouth; and 4 cubic centimeters of thromboplastin administered intravenously. Signs of hæmorrhage continued until the red blood reached 3,000,000 and hæmoglobin 50 per cent, at which time she received 20 cubic centimeters of fresh rabbit blood intramuscularly. Donors were typed for transfusion. Slight improvement, however, made transfusion unnecessary. Hæmorrhage was controlled on fifth day. Her recovery was gradual and uneventful. Both wounds healed *per primam*. A complicating feature of this case was the tachycardia, which necessarily made it difficult to ascertain a true clinical picture. Since recovery she shows a + 13 basal metabolism.

In conclusion I desire to state that I have by exclusion ruled out the usual causes of intestinal hæmorrhage. Also I am positive that this case did not originate from an inverted stump. However, it does seem logical to me that the slight trauma experienced in trying to deliver the appendix through a McBurney incision could have been responsible for thrombosis with a resulting embolism of the walls of the intestine, and later ulceration and hæmorrhage.

In the 43 cases collected there were 21 recoveries, 21 deaths, and 1 in which the result is not stated.

In 5 cases, those of Mitchell, Pybus, Theleman, Schwalback (2 cases), the hæmorrhage was from the bowel. All of these patients recovered. In one case (Muehsam), the hæmorrhage was both from stomach and bowel. Patient died.

In 7 cases the hæmorrhage was from the wound, viz., the cases of Torrance, White, Skevington (2 cases), Corner, Ward, and Karpeles. Five of these patients recovered and 2 died. It is doubtful if these cases should be included.

In the 26 cases with a gastric hæmatemesis, there were 17 deaths. It is easily seen, therefore, that this type of postoperative hæmorrhage is far more fatal than any other, giving a mortality of more than 65 per cent.

In 3 cases the nature of the hæmorrhage is not clearly stated. In 4 of the wound-hæmorrhage cases the deep epigastric artery was involved; and in one case the external iliac artery. Erosion of the vessels is specifically mentioned in 5 other cases, and the occurrence of ulcers in stomach and duodenum is noted in 4 cases.

Comparing these results with hæmorrhage after general abdominal operations Busse reported 14 personal cases of this type and collected 82 others from the literature. The mortality in this series of 96 cases was 55 per cent, which is much the same as in the appendicectomy cases.

The exact etiology of postoperative hæmorrhages following abdominal operations has never been satisfactorily settled. Karpeles says that direct hæmorrhage after appendicectomy has been noted from the superficial abdominal vessels, the meso-appendix, the bowel, the abscess cavity, and from the deep epigastric and external iliac arteries. Secondary hæmorrhage is caused by a purulent periarteritis arterionecrosis taking place.

In addition to the cases reported in the annexed table, hæmorrhage from the bowel arising from the stump of the appendix has been reported a number of times. Mitchell's case in the table appears to be of this type, but Mitchell distinctly states that re-operation showed that the bleeding was not from this source.

In a report by Wyeth on the technique of appendicectomy, he refers to postoperative hæmorrhages from the stump. He states that Deaver had 2 cases, Hessert 3 cases, Knoth 2 cases, Halstead 2 cases, and Graham, Lund, Hughes, Nicholson, Laplace, Fowler and Elsberg, each 1 case. Judd of Honolulu reported a similar case.

In 6 of these 16 cases reported by Wyeth of postoperative bleeding from the bowel, it was clearly proved, by re-operation in 5 and by postmortem in 1, that the hæmorrhage came from the inverted stump of the ap-

TABLE I.—SUMMARY OF FORTY-THREE CASES COLLECTED FROM THE LITERATURE

Case No.	Reported by	Age and Sex	Nature of Disease	Treatment	Postoperative Course	Results	Remarks
1	Sir D. Duckworth. Med. & Surg. Tr., 1889, lxxii, 433	M. 16	Gangrene appendix	Operation	Hæmatemesis 8th day	Recovery	
2	Guyot and Carlas. Bull. Soc. anat. et physiol. de Bordeaux. 1889 Nov. 20	M. 14	Appendicitis	Operation 6th day	Vomited black blood evening following operation	Death	Autopsy: Stomach distended with blood; stomach mucosa was ecchymotic in spots.
3	Charlot. Thèse de doct., Paris, 1900	— 8	Appendicitis with peritonitis	Operation 5th day	Morning following severe vomiting black blood	Death	Autopsy: Hæmorrhagic spot on the stomach mucosa; some blackish adherent masses and crateriform depressions containing black masses of the dimensions of a pinhead.
4	Ibid.	— 9	Appendicitis with peritonitis	Operation 3rd day	Eight to ten hæmatemeses	Death	Autopsy: hæmorrhagic spot on stomach mucosa.
5	Ibid.	— 8½	Appendicitis with peritonitis	Operation	Vomited dark fluid	Death	Autopsy: 100 grams of black blood found in the stomach. Two large eroded placques in the stomach mucosa.
6	Kermisson, E. Gaz. hebdom., 1900, v, 1	F. 7	Appendicular abscess in right iliac fossa	Operation 4th day	Enormous hæmatemesis	Death	
7	Mintz, W. Mittl. a. d. Grenzgeb. d. med. u. Chir., 1900	M. 40	Appendicular abscess	Operation	Hæmorrhagic vomiting immediately after operation	Death on 7th day	Autopsy: Liver atrophy. Erosions in small curve of stomach; obliteral arterial lumina.
8	Walch. Bull. Soc. de chir., Paris, 1901, xxvii, 374–378. (Reported by Berger)	M. 40	Appendicitis. Tumor consisted of a mass of omentum indurated and adherent to cæcum	Operation. Ligated around base of appendix but did not cover stump with serosa	Patient developed rightsided pleurisy 3 days after operation. Vomited 300–400 c.cm. of blood mixed with stomach contents; passed large quantity of blood per rectum	Recovery	Attributes hæmorrhage to slipping of ligature.
9	Championnière, L. Bull. Acad. de méd., 1902, ii, 19	F. 36	Gangrene appendix	Operation	Vomited black blood. Stomach lavage with soda water. Serum injection	Recovery	Patient 6 months gravid.
10	Fushsig, Ernst. Wien. klin. Wchnschr., 1903, xvi, 737	M. 13	Appendicular abscess	Operation. Gangrene appendix	Hæmatemesis	Death	Autopsy: Hæmorrhagic eroded stomach; small capillary thrombi.
11	Landow, M. Arch. f. klin. chir., 1902, lxvi, 900–918	M. 36	Appendicular abscess	Operation	Hæmorrhagic vomiting following day	Recovery	
12	Sanio. Dissertation, Munich, 1903	M. 54	Appendicular abscess and circumscribed peritonitis	Operation 4th day	Following day severe hæmatemesis	Death	No autopsy.
13	Ibid.	M. 36	Acute appendicitis	Operation	Hæmatemesis following day	Death on 4th day	Autopsy: Ulcers in pylorus and duodenum, in the first an open blood vessel.
14	Ibid.	M. 14	Appendicitis with diffuse peritonitis	Operation	Following day vomited dark fluid	Death 7 days later	Autopsy: Ulcer on stomach near pylorus with eroded vessel.
15	Payr. Zentralbl. f. Chir., 1904	Not stated	Chronic appendicitis	Operation. It showed omentum much inflamed; during the operation observed thrombosis of omentum. Part of omentum resected	Gastro-intestinal hæmorrhage on 7th day	Recovery	

TABLE I.—SUMMARY OF FORTY-THREE CASES COLLECTED FROM THE LITERATURE—CONTINUED

Case No.	Reported by	Age and Sex	Nature of Disease	Treatment	Postoperative Course	Results	Remarks
16	Busse. Arch. f. chir., 1905, lxxvi, 122	M. 31	Acute appendicitis	Operation	Heavy hæmatemesis following day. On 12th day wound reopened on account of dehiscence and protrusion of omentum	Recovery	
17	Ibid.	M. 27	Symptoms of appendicitis	Appendicectomy for symptoms	Severe hæmatemesis 1st and 2nd day	Recovery	
18	Ibid.	M. 34	Appendicitis	Appendicectomy a froid	Severe hæmatemesis the first three days	Recovery	Appendix and cæcum fixed by adhesions to anterior abdominal wall.
19	Ibid.	M. 30	Chronic appendicitis	Operation. Mesenterial necrotic abscess	Hæmatemesis 1st and 2nd day	Recovery	
20	Martens. Deutsche med. Wchnschr., 1907, in discussion by Muehsam	M. 12	Appendicitis with diffuse peritonitis	Operation. Gangrene appendix	Hæmatemesis 6 days later	Death	Autopsy: Necrotic duodenal ulcer; pancreaticoduodenal artery eroded.
21	Muehsam, R. Deutsche med. Wchnschr., 1907, xxxi, 1255–1256	M. 10	Acute appendicitis	Operation. Gangrene appendix also omentum	Bloody vomit and stools on 7th day	Death on 10th day	Autopsy: Peritonitis duodenal ulcer with erosin of gastroduodenal artery.
22	Schwalbach, G. Deutsche Ztschr. f. Chir., 1908, xcv, 141–157	F. 28	Acute appendicitis	Operation. Appendix and cæcum adherent. Pus in appendix	Severe bloody stools after 3 days continuing until 9th day	Recovery	
23	Ibid.	M. 35	Acute appendicitis	Operation. Appendix buried in adhesions with cæcum, etc.	Tarry bloody stools on 5th day continuing for 6 days	Recovery	
24	Thelemann. Deutsche Ztschr. f. Chir., 1908, xciii, 80	M. 30	Appendicular abscess	Operation. Appendix perforated	Bloody stools after 13th day	Recovery	
25	Mitchell, C. F. Ann. Surg., 1908, xlviii, 626	F. 26	Right-sided salpingitis. Appendix removed with mass	Operation. Appendix crushed and turned in by means of a catgut purse-string suture	11 hrs. after operation, patient restless, pallid. Pelvis opened found perfectly dry, no hæmorrhage. Following day enema brought away large bloody stool. Five more bloody stools passed. Day following vomiting of dark blood	Recovery	Author reports case because hæmorrhage did not come from inverted stump.
26	Dieulafoy, M. Bull. méd., Par., 1904, xlv, 17	M. 68	Voluminous turgescent appendix. No peritonitis	Operation		Death	Patient succumbed asphyxiated to violent hæmatemesis on 3rd day after operation.
27	Ibid.	F.	Appendicitis 3 days duration	Operation. Appendix immobilized behind cecum adhesions. Ecchymotic cavity filled with purulent magma	Two days after operation vomited about 200 grams of black blood	Recovery	
28	Ibid.	F. 20	Appendicitis	Operation. Fourth day. Appendix voluminous. Ice, serum, oxygen	Day after operation vomiting of blood	Death	Patient succumbed to final hæmatemesis irrupting into trachea and bronchii.
29	Ibid.		Appendicitis. Third attack	Operation. Gangrene appendix found	Complicated by severe hæmetemesis	Not stated	
30	Ibid.	M. 18	Appendicitis 3 days duration	Operation. Fetid abscess; diffused peritonitis, gangrenous	Day following vomited 100 grams black blood	Death	Operation delayed 11 hrs. by family; 3 gangrenous patches on cæcal walls
31	Ibid.	F. 10	Appendicitis and peritonitis	Operation. 42 hrs. later. Appendix gangrene	Two days later vomited black blood	Died	Death occurred in attack of vomiting blood
32	Ibid.	M. 28	Appendicitis	Operation. Anterior vertical through rectus sheath	Ten days after operation hæmorrhage occurred. Arrested bleeding by plugging. Three days later ligatures failed	Death	Transfusion in vain. Patient too weak. Hæmorrhage from deep epigastric artery.

33	Goodwyn, H. Brit. M. J., 1911, ii, 620	F.	Appendicitis	Operation. Long irritable appendix dipped behind cæcum toward pelvis brim. No difficulty	Following day vomited half a pint blood, and some clots. Adrenalin, ice, strychnine, limbs bandaged, foot of bed elevated	Death 56 hrs. after operation	
34	Torrance, G. M. Atlanta J. Rec., 1913–1914, lx, 346	M.	Appendicitis	Operation. Found gangrene appendix. Right rectus incision	Hæmorrhage so prolonged bed and floor in a pool	Recovery	Wound tightly packed in lower angle, hæmorrhage stopped. The hæmorrhage was from the deep epigastric artery.
35	White, C. S. Surg., Gynec. & Obst., 1914, xix, 679	M. 41	Acute appendicitis	Operation. Same day. Right rectus incision necrotic appendix, drainage	Fourth night dressings saturated with fresh blood. Following 24 hours same. Salt solution per rectum	Recovery	Author attributes cause to deep epigastric artery eroded by drainage tube or opened by an advancing infection.
36	Skevington, J. O. Lancet, Lond., 1914, clxxxvii, 104–105	M. 16	Appendicitis	Operation	Ten days after operation hæmorrhage from lower angle of wound	Recovery	Two deep thread sutures were passed through the whole thickness of abdominal wall at the inner edge of the wound. Hæmorrhage ceased; hæmorrhage from deep epigastric artery.
37	Corber, E. Med. Press & Circ., 1914, n. s. xcviii, 519	M. 10	Acute appendicitis	Operation. Sloughing, appendix lay internal to cæcum. Right rectus incision	Seventh day bandage soaked with blood plugged wound with gauze	Death	Autopsy showed ulceration of the external iliac artery; its walls had suddenly given away.
38	Ward, W. G. Surg., Gynec. & Obst., 1915, xx, 101	M. 24	Acute appendicitis	Operation. Pus oozing from tip of appendix, cigarette drain	Midnight free bleeding. Bleeding continued until 5th day. Cæcal fistula developed. Irrigated with salt solution and in wash a piece of necrotic omentum tissue came	Recovery	Bleeding from wound.
39	Karpales, S. R. Wash. med. Annals, 1917, 16, 171	M. 21	Appendicitis	Operation. Gangrene appendix. Large cavity in same region filled with foul smelling pus was evacuated. Catgut used to ligate mesoappendix and bury stump. Cigarette drain	Hæmorrhage from wound 12 days after operation. In 25 minutes patient was in in a pool of blood	Recovery	Patient presented characteristic picture — pallor, feeble pulse, etc.
40	Drybrough - Smith, E. Lancet, Lond., 1918, cxcv, 15	M. 12	Acute appendicitis first 4 days. Subacute for 4 weeks	Operation. Started to vomit after narcosis. Drainage. Appendix showed circular ulcer of mucosa within an inch of base	Vomited dark brown fluid before leaving operating room. Vomiting continued; quantity 3 to 4 oz. to 8 to 10 oz. every hour lavage, bicarbonate of soda. Adrenalin chloride in 10 mm. doses (sol 1:1000 every 2 hours)	Recovery	
41	Vere-Arkle, J. Lancet, Lond., 1918, cxcv, 861	F. 19	Chronic appendicitis severe acute attacks	Operation. Few adhesions. No operative difficulty	Symptoms of hæmorrhage 8 hours after operation. Wound reopened, everything found in order. Vomited dark blood 4 hours later. Continued to vomit dark fluid for hours. Hypodermics of morphine atrophine, etc.	Died 24 hours after operation	No autopsy allowed.
42	Ibid.	F. 10	Appendicular abscess	Operation. Appendix gangrenous. Part of omentum gangrenous. Abscess drained	Symptoms of hæmorrhage 6 hours after operation. Wound reopened, no sign of hæmorrhage there. Intense dark vomit 12 hours after operation and continued till death	Died 16 hours after operation	No autopsy allowed.
43	Pybus, F. C. Brit. J. Surg., 1920–1921, viii, 534	M. 47	Chronic appendicitis	Operation	Rise in temperature for several days. Maximum 120°. P. 130. Twenty days after operation, passed 2 pints dark blood from bowel with a large clot; iliac fossa tender; hæmorrhage repeated. Laparotomy, coil of ileum adherent near perforation at apex of cæcum and hæmatoma adjoining it. Closed	Recovery	Author thinks appendicular artery was punctured and formed a hæmatoma in the mesentery which became adherent to ileum and cæcum and gave rise to the hæmorrhage.

pendix. Thirteen of these 16 cases recovered; 3 died. In this type of hæmorrhage purse-string catgut sutures with insufficient ligation of the appendix stump, or at least of the artery, has been variously incriminated. Judd was not, however, satisfied that his case was due to oozing from the stump but thinks that the hæmorrhage from the bowel in his case (as well as in cases by Walch and Kelly) was similar in origin to "hæmatemesis following abdominal operations."

The hæmatemesis following abdominal operations has long been known as mentioned in the beginning of this paper. The earlier views were that such hæmorrhages were due to arterial thrombosis, especially after hernial operations. The mechanism is arterial ischæmia altering the arteries which rupture, owing to the blood efflux following relief of hernial strangulation.

French surgeons at an early date, as mentioned by Sauvé, attribute these hæmorrhages to a peritoneal infection and consequently think that they are of the same nature as appendicular hæmorrhages. Regnier thought that they were due to paralysis of the mesenteric nerves which produce vasodilatation of the arterial capillaries. The intestinal arterial circulation is regulated by the mesenteric nerves.

But the pathological changes which take place after the various abdominal operations give rise to hæmorrhage either from the bowel or stomach have not as yet been satisfactorily explained. Moynihan states that the hæmatemesis may follow any abdominal operation, but it is especially to be looked for when the stomach, duodenum, or bile passages are the seat of the disease. He mentions five theories, viz:

1. Anæsthetic.

2. Distinct injury to stomach or bowel, resulting in ulceration from which blood comes.

3. (von Eiselsberg) Injury to the omentum, producing a thrombosis of the omentum, which is followed by embolism in the walls of the stomach or bowel.

4. Sepsis (Rodman's theory).

5. Reflex influence (Mayo Robson).

Moynihan thinks Rodman's theory is the correct one.

It will be noted that in several of the cases reported after appendicectomy in annexed table, a necrotic spot was found on the stomach mucosa.

The modern view based on the pathology points to sepsis and toxæmia as the basic cause of the hæmorrhagic lesions; and in the case of a diseased, gangrenous, or perforated appendix, the spread of the infection to some neighboring vessel and thence to the stomach or intestinal wall is easily comprehended. Such a mechanism is well known; for instance, in the case of postoperative hæmatemesis after a gastro-enterostomy has been done for duodenal ulcer.

As stated by Rodman the gastric mucosa is particularly liable to congestion and hæmorrhage in conditions of sepsis.

To my mind trauma or embolism, either separately or collectively, seems a more logical solution of the true cause of this condition than any of the other etiological factors, for in either we may have sepsis and necessarily with both we may have slough, thus the possibility of hæmorrhage.

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THE DISTRIBUTION OF ACID CELLS ALONG THE DORSAL CURVATURE OF THE STOMACH AND THE POSSIBLE RELATION TO THE OCCURRENCE OF GASTRIC ULCER[1]

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IN a previous paper,[2] the distribution of the acid cells along the lesser, greater, and ventral curvatures of the stomach was determined, but the dorsal curvature (an axial line of the dorsal surface) was not surveyed.

As gastric ulcers are more common along the dorsal surface than elsewhere in the stomach, a special study was made of the dorsal curvature to see if there might be a histological reason for the occurrence of this condition.

The two stomachs used were obtained as soon as possible after death and were prepared in the same manner as described in the preceding paper, consequently this detail will not be repeated here.

Although the main interest lay along the dorsal curvature, the greater and lesser curvatures were also studied and the thickness of the mucosa at various points was measured.

In studying the *lesser curvature* in the first case (Fig. 1) we find at the cardiocesophageal junction the oxyntic cells few in number and of medium size. About 2 centimeters from the œsophageal orifice, the cells increase in number and are located mainly in the fundal portion of the glands. The cells become fairly numerous toward the cardiopyloric junction; they also increase somewhat in size and become more numerous in the necks of the glands. At the cardiopyloric junction there is a fairly sharp reduction in the number of oxyntic cells and only a few scattered acid cells are seen beyond the junction. The position of the junction is 60.07 per cent of the distance from the cardiac orifice.

A study of the *greater curvature* in Figure 1 shows at the cardiocesophageal junction, the acid cells practically absent, but cardiac glands numerous. As the cardiac glands cease, the acid glands become quite numerous and are located in the necks of the glands. These acid cells continue fairly numerous, with areas of reduction due probably to catarrhal conditions. Toward the cardiopyloric junction, these cells fluctuate in number and cease fairly sharply at the junction.

The junction is 87.5 per cent of the distance from the cardiac orifice.

The *dorsal curvature* in Figure 1 shows at

[2] Internat. J. Gastroenterol., 1921, July.

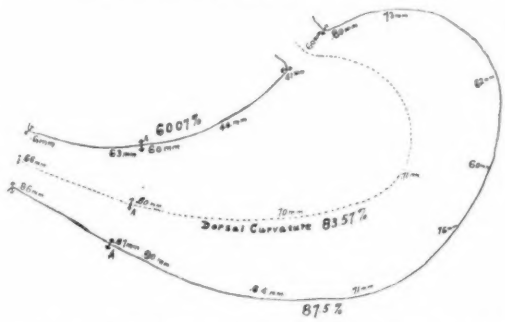

Fig. 1. Diagram of stomach No. 4(Zx) indicating the lesser, greater, and dorsal curvatures. The arrows indicate the histological boundaries and those arrows at the points *A* indicate the points of ending of the oxyntic cells (cardiopyloric junction) along the curvatures. This is also indicated in percentage of the distance from the cardiocesophageal junction. The thickness of the mucosa is indicated at various points in fractions of a millimeter.

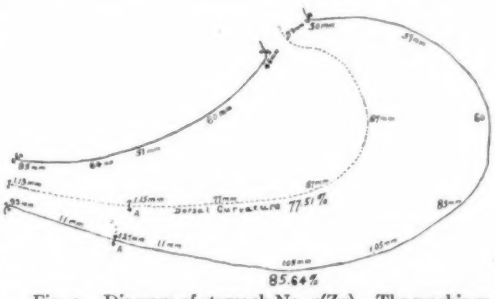

Fig. 2. Diagram of stomach No. 5(Zy). The markings and indications are the same as in Figure 1.

[1] From the Laboratories of the Daniel Baugh Institute of Anatomy of the Jefferson Medical College.

the cardiocesophageal junction, the cardiac glands numerous and the oxyntic cells few in number. Farther on at first the acid cells are few and scattered. They are located mainly in the necks of the glands. About half way toward the cardiopyloric junction, the acid cells increase in number and are found chiefly in the necks of the glands. From this region to the junction there are alternating decreases and increases in the number of acid cells and a sudden cessation at the junction. The junction is 83.57 per cent of the distance from the cardiac orifice.

The pieces of the *lesser curvature* (Fig. 2) became rather twisted so that the sections were not representative and were discarded.

The *greater curvature* (Fig. 2) shows at the cardiac orifice the cardiac glands numerous and the oxyntic cells few in number. In the beginning of the fundus the acid cells increase somewhat, but are still comparatively few. They are located chiefly in the necks of the glands. From here to the cardiopyloric junction, there are alternating decreases and increases of acid cells, but nowhere are they quite numerous. At the cardiopyloric junction they cease quite abruptly with only a few scattered cells beyond.

The junction is 85.64 per cent of the distance from the cardiac orifice.

The *dorsal curvature* in Figure 2 shows at the cardiac orifice the cardiac glands absent and the acid cells few in number. Farther on the acid cells increase somewhat, but are not to be considered numerous. This is possibly due to catarrhal changes. Well beyond the fundus, the glands become almost normal and the acid cells are quite numerous and are located chiefly in the necks of the glands. Some of these cells are so large that they might readily be called *giant acid cells*. Toward the cardiopyloric junction the cells continue numerous and are located chiefly in the necks of glands, ceasing abruptly at the junction.

The cardiopyloric junction is 77.51 per cent of the distance from the cardiac orifice.

In comparing these results with those obtained in the preceding paper, the following is noted:

Along lesser curvature of the stomach the distribution of the acid cells is a little less than the average of the three organs reported. Taken altogether, however, the average distribution along the lesser curvature is 63.09 per cent. This represents an average of slightly under two-thirds of the distance from the cardiac orifice.

TABLE I.—ACID CELL DISTRIBUTION

No.	Lesser Curv.	Greater Curv.	Dorsal Curv.	Ventral Curv.
1.	57.20	79.40	....	74.25
2.	64.71	74.77	....	79.10
3.	70.40	80.42	....	76.10
4. (Zx)	60.07	87.50	83.57	....
5. (Zy)	....	85.64	77.51	....
Average	63.09	81.55	80.54	76.48

Along the greater curvature the extent of the distribution of acid cells in stomachs Nos. 4 and 5 is greater than in any of the preceding cases. As a result the average distance is 81.55 per cent. This represents over three-fourths of the distance from the cardiac orifice and a greater proportionate distance than along the lesser curvature.

In the two stomachs, Nos. 4 and 5, the acid cells extend farther along the dorsal curvature than they do along the ventral curvature. Along the ventral curvature the distance is 76.48 per cent or just slightly over three-quarters of the distance, while along the dorsal curvature the acid cells extend 80.54 per cent of the distance.

Along the *lesser curvature*, stomachs Nos. 4 and 5 show the mucosa to be quite thin. In No. 4 there is only a slight difference in thickness between cardiac and pyloric areas, while in No. 5 the difference in thickness at the pylorus is more noticeable.

Along the *greater curvature* the same condition prevails in both stomachs.

Along the *dorsal curvature* No. 4 shows no appreciable increase in thickness at pylorus, while No. 5 shows quite marked increase.

In comparing the thickness in the mucosa in the various regions with the corresponding measurements of the stomachs, Nos. 1, 2, and 3, one notes the lack of consistency in these measurements. It would seem as though each stomach were a law unto itself as far as the thickness of the mucosa is concerned. To state flatly that the mucosa is of a stated definite thickness at the cardiac orifice and that this becomes double or more at the

TABLE II.—THICKNESS OF THE MUCOSA OF THE STOMACH[1]

	Cardiac mm.	Fundus mm.	Intermediate mm.	Junction mm.	Intermediate mm.	Pylorus mm.
GREATER CURVATURE						
1.	1.50	1.50	0.90	0.97	0.80	0.75
2.	0.79	0.86	0.79	0.69	0.71	0.60
3.	0.65	0.57	0.79	0.71	0.79	0.75
4.	0.80	0.62	0.71	0.67	0.70	0.86
5.	0.50	0.60	1.05	1.27	1.10	0.93
Average	0.85	0.83	0.85	0.86	0.82	0.78
VENTRAL CURVE						
2.	0.66	0.83	0.83	0.71	0.71	1.00
3.	0.62	0.60	0.76	0.65	0.76	0.61
Average	0.64	0.71	0.80	0.68	0.74	0.80
DORSAL CURVE						
4. (Zx)	0.60	0.71	0.70	0.60	.....	0.66
5. (Zy)	0.53	0.67	0.67	1.15	.....	1.13
Average	0.57	0.69	0.69	0.88	.....	0.90
LESSER CURVATURE						
1.	1.4	0.93	1.0	0.86	.....	0.86
2.	0.60	0.74	0.86	1.07	.....	1.07
3.	0.80	0.79	0.64	0.86	.....	0.93
4. (Zx)	0.41	0.44	0.60	0.63	.....	0.60
5. (Zy)	0.40	0.60	0.51	0.64	.....	0.95
Average	0.71	0.70	0.72	0.83	.....	0.88

pylorus, with proportionate increases in the intermediate parts, does not seem wise. The *intermediate* measurements are frequently greater than those at the cardiac orifice.

The average of all measurements along the lesser curvature shows a slight increase in thickness at the pylorus.

Along the *greater curvature* the average thickness of the mucosa at the pylorus is less than that at the cardia (almost the figures along the lesser curvature reversed).

Along the *ventral curvature* the thickness of the mucosa fluctuates, but the pyloric mucosa is slightly thicker than that at the cardia.

Along the *dorsal curvature* there is a gradual increase from cardia to pylorus.

GASTRIC ULCER

With reference to gastric ulcer it is stated that the condition occurs most frequently in the pyloric portion of the stomach and along the dorsal wall. It is stated that 75 to 80 per cent of chronic ulcers occur in the pyloric portion of the stomach. Of those, the lesser curvature seems to have the most, 36 per cent, the dorsal wall 25 per cent and pyloric (orifice region) 15 per cent. The question naturally arises as to whether there is any histological explanation therefor.

[1] Table II consists of the measurements of three stomachs in the preceding paper with the addition of the two recent ones.

The statement as to location is too indefinite. In order to draw any decided conclusions it would be necessary for the surgeon to state exactly how many millimeters from the pyloric orifice the center of the ulcer was located to find out whether or not the ulcer comes within the boundary of the *histological pyloric portion*.

In an earlier paper the writer has definitely shown that the histological and anatomical pyloric dimensions do not coincide so that a more definite location would be necessary, i.e., exact distance from the pyloric orifice.

Another source of help would be to obtain such stomach postmortem and prepare as above and note any change in the acid cells of the neighborhood of the ulcers.

As 75 to 80 per cent of the ulcers occur in the pyloric end, it means that their location is in part free from acid cells or along the border line where they are about to cease. It would seem that these oxyntic cells in some way protect that part of the organ in which they are located. In those cases in which they occur in the body of the stomach, it may just be possible that the acid cells in that instance are not so widely distributed as in the average individual, i.e., those stomachs studied by the writer. In analyzing the occurrence of ulcers on the different walls, one finds that the lesser curvature suffers most. Strange to say, the acid cells cease earlier than along the other curvatures. The greater curvature seems to suffer least, and here one finds that the acid cells extend farther toward the pylorus, possibly exerting a protective function. The dorsal wall suffers next to the lesser curvature and here one notes that the acid cells extend somewhat farther than along the lesser curvature, but not so far as along the greater curvature.

Although there seems to be some relation between the occurrence of these ulcers in the different regions of the stomach and the distribution of the acid cells, the evidence is too little to be conclusive. As suggested before, in those cases of ulcer coming to necropsy, the stomach should be surveyed as in the preceding work.

The writer desires to express his thanks to Prof. Coplin and his assistants, Drs. B. Crawford and E. Weiss, for their courtesy in supplying the above material.

TETANUS

Report of One Hundred Sixteen Cases at the Massachusetts General Hospital

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"ANOTHER receiv'd an insignificant wound to speak of (for it was not deep) a little below his neck behind from a sharp dart; which being taken out not long after, he was drawn and distorted backwards, as in the opisthotonus. His jaws were also fasten'd; and, if anything moist was put into his mouth, and he attempted to swallow it, it return'd again thro' the nose. In other respects he grew worse immediately. The second day he dy'd." Thus wrote Hippocrates (1) and from then until now we find throughout medical literature reports of cases, and various interesting theories, about this unusual disease. In Paris, in 1786, at the Imprimerie Royale, was published a work under the title "Projet d'Instruction sur une Maladie Convulsive, frequente dans les Colonies de l'Amérique, connue sous le nom de Tétanos. Demandé par le Ministre de la Marine, à la Société Royale de Médecine." Here the author noted the fact that tetanus often occurred only after the wound was dry and healing was well advanced.

The following title is of so much interest that it is given in detail:

AN INAUGURAL DISSERTATION
on the
ANIMATING PRINCIPLE, or ANIMA MUNDI
of
TETANUS, or LOCK-JAW

Read and Defended at
PUBLICK EXAMINATION
Held by the Medical Professors, before the
REV. JOSEPH WILLARD, S.T.D. President
and the Governors of the University at Cambridge for the Degree of Bachelor in Medicine
July 3rd, 1795
By FREDERICK MAY, A.M.

Dr. May divided tetanus into three groups: first, cases from punctured wounds; second, those from cold, or freezing; third, tetanus of the new-born. It was his theory that "the wounding instrument, a nail, for instance, disarranges the exquisite texture of the nerve, or tendon. If suppuration could take place, it would probably remove the offending cause. As the cause remains, the effects increase, and the disarrangement of texture creeps along the course of the nerve until it affects that whole system of nerves." He was pessimistic as to prognosis. He advised the production of "suppuration in the first instance, by an incision in the wounded part," thus . . . "the injured nerve is enabled, and solicited, to throw off the irritating injury, and recover its tone. . . . But the medicine most to be depended upon, is tobacco." This he gave by rectum, in frequent strong infusions, 2 ounces of tobacco simmered in one-half pint of water.

In 1834 The Royal College of Surgeons, London, awarded the Jacksonian Prize to Thomas Blizard Curling, for his "Treatise on Tetanus." At that early day he reported 128 cases, of which 58 recovered (8 were his own cases). He felt, however, that the prognosis was almost always unfavorable.

Before considering our own cases, we will briefly summarize the literature, though this is unnecessary to anyone who has read the valuable article of Ashhurst (23).

The bacillus of tetanus was first discovered by Nicolaier in 1883, first isolated and cultivated by Kitasato, and the first antitetanic serum was obtained by Roux and Vaillard in 1893. The bacillus is a slender rod 4μ in length and 0.3 to 0.4μ in width, readily forms spores, and is anaerobic (2). It lives in rich cultivated earth, and Lukas (3) has found it in the stools of sixteen out of seventeen horses; he thinks it is a common saprophyte in almost all of them. Also Fox, quoted by Ashhurst and John (4), has found it in the stools of 5 per cent of mankind, and 20 per cent of those working around horses. Ninni (5) cultivated bacillus tetani from the intestinal tracts of 42 rabbits and guinea-pigs, but failed to

find it in the soil of mountain regions and other places which are free from the dejecta of animals. The bacillus, once having gotten in the wound, produces the toxin which causes the symptoms, but it grows much more readily in symbiosis with certain other bacteria, especially bacillus welchii and vibrion septique, as noted by Tulloch (6). This writer believes that antibodies for bacillus welchii and vibrion septique should be included in every antitetanic serum. Tulloch (8) divides the bacillus into four types, by agglutination tests — of one hundred cases of tetanus, type I showed 41 cases; type II, 20 cases; type III, 35 cases; type IV, 3 cases. Type I showed the lowest mortality.

As is well known, the bacillus itself does no damage, but the toxin which it elaborates is the cause of the symptoms. The paths of spread of the toxin have been recently studied by Teale and Embleton (7), who have proved that it makes its way to the cord not only via the axis cylinders, but also by the perineural lymphatics. A large amount of the toxin is taken into the general circulation and from the blood vessels reaches the connective-tissue spaces and thoracic duct, but does not pass from the vessels of the central nervous system to the tissues thereof—it does not pass from the choroid plexus to the cerebrospinal fluid. The toxin, arriving at the cord, becomes impregnated in the motor cells, irritating them and causing tonic spasm of the muscles which they control.

The disease may be divided into two great categories—tetanus ascendens or local tetanus, and tetanus descendens or general tetanus. In tetanus ascendens the toxin, making its way directly to the cord, causes first an involvement of the muscles of the wounded extremity, followed or not, before death, by other general symptoms. Sawamura has proved that this form can not be caused in experimental animals if the nerves to the leg are cut before the injection of the toxin. Before the introduction of antitetanic serum as a prophylactic, local tetanus occurred in about 1.1 per cent of the cases; after its preventive use this form occurs in 16.5 per cent (9). Tetanus descendens is by far the more common form; in this the involvement of the central nervous system brings about first of all symptoms in the muscles of the jaws and neck, followed by more or less extensive involvement of the rest of the body. In their valuable monograph Courtois-Suffit and Giroux (10) mention four cephalic types, viz.:

(1) Cephalic form without paralysis; (2) cephalic form with paralysis of facial nerve; (3) cephalic form with paralysis of motor nerves of eye; (4) cephalic form with paralysis of hypoglossal nerve.

They speak also of the very rare localized "abdominothoracic" form, in which the lower half of the trunk is so tense that it seems transformed into marble. Especially in the past there has been much discussion of "tetanus neonatorum," and a recent case is reported by Renton (11), in which the site of inoculation was undoubtedly the umbilicus; also another in a ten days' infant by Egnia (12).

The bacillus of tetanus grows much more rapidly and virulently if there is a foreign body retained in the wound (13). This fact has been well recognized, especially since the past great war, and makes the indications for removal of the foreign body so much the greater. The muscles most frequently involved appear to be, first, the masseters, then the posterior cervical muscles, those of the anterior abdominal wall, the spinal muscles in the dorsal and lumbar region, and lastly the flexors of the hip, knee, and ankle joints (13).

In addition to the usual occurrence of tetanus following wounds, it occasionally horrifies the surgeon by occurring in well-appointed hospitals after ordinary surgical operations. One of our cases occurred 10 days after an operation for acute gangrenous appendicitis—culture of the discharge and the stools was negative, and the cause was never ascertained. Recently there have been nine deaths from this postoperative incidence in the Madrid General Hospital (14), in patients who were already convalescent or who had been discharged as cured. Careful examination of all materials used in the operations failed to show anything, but it was thought that the germs were in the catgut. This postoperative form has been carefully studied

by Huggins (15) who advocates withholding green vegetables for several days before operations involving the gastro-intestinal tract. In the recent war the Surgeon-General of the United States ordered a prophylactic injection of antitetanic serum before every rectal operation. In addition to the above, it is to be noted that tetanus may come from wounds so slight and so superficial that they are hardly noticeable, and it is not at all unheard-of to have a clear-cut clinical case, and yet be quite unable to find the focus of the disease. In one of our cases trauma was absolutely denied, though we found an old crusted lesion on one leg. In the war tetanus occurred in cases of "trench-foot," a circulatory disorder due to prolonged exposure of the feet to wet and cold; in which disease, in its advanced stages, blisters and even local gangrene were superimposed on great œdema. Prophylactic serum was given in all these cases. A number of fatal cases occurred some years ago following the injection of diphtheria antitoxin; evidence was brought forth which showed that a horse supplying the antitoxic serum had died of tetanus shortly after the bleeding which furnished the fatal serum, but at the time of the bleeding no symptoms of tetanus had been noticeable (2).

It must be borne in mind that the character of the disease is usually much modified if the serum has been used as a prophylactic measure. In the first place the incubation period is much prolonged. Sir David Bruce, in an analysis of 1,426 cases, found that the usual incubation had been lengthened to 39.5 days (16). The occurrence of local tetanus is, as noted above (9), about fifteen times as common. Furthermore, the severity of the disease is much less, and the mortality correspondingly lower; the mortality among British troops at the beginning of the war averaged 57.7 per cent, and in 1918 it had been lowered to 26.0 per cent (16). A few observers have criticized the use of antitetanic serum in this way, but its value has been clearly demonstrated to be so great, and its dangers so slight, that the arguments against it fade into insignificance.

Applying this knowledge to our own civilian surgery, it may be said that a preventive injection should be given in any case, however slight, in which there is any reason to fear tetanus. This applies chiefly to dirty punctured wounds of the feet or hands, severe lacerating wounds of any part of the body, and especially compound fractures. Its value varies directly with the lapse of time between the receipt of the injury and the time of administration—the sooner it can be given the better. The antitoxin in the blood is all eliminated in about 10 days, and in severe wounds a second dose should be then given, and to be doubly sure, a third dose in about 20 days.

The recent war has demonstrated that a secondary operation, even months after the original wound, may be the means of causing tetanus by stirring up to renewed activity spores which have been lying dormant in the tissues. Such cases are not rare (17), and the second operation should always be preceded by a prophylactic injection; the same would apply in civilian as in military life.

Before proceeding to the serum treatment of the disease, it is well to mention other methods, though I shall pass over them briefly as they are secondary in importance. Carbolic acid, in hypodermic and intra-muscular injections, as first suggested by Baccelli, and later tried out by numerous workers, has proved to be of no marked benefit, and it is doubtful if it is worth trying. Camus (18), as a result of his experiments on dogs, says that though it may have a depressant and anæsthetic action, it has no effect in stopping the progress of the disease. Magnesium sulphate, since first suggested by Meltzer, has been thoroughly tried out, though this again has no specific action, being used merely as a depressant. The usual method has been to give it intraspinally, about 1 cubic centimeter of a 25 per cent solution for every 25 pounds of body weight. Some cases have gotten well, whether because of, or in spite of this, one can hardly say. It has not recommended itself highly to most observers, and is not indicated as a routine measure. Porter and Richardson (19) in two cases in this hospital isolated the bacillus from inguinal glands, the wounds being on the foot; and they say that, this being so, certain cases will arise in which the removal

of lymphatic glands will be indicated to ensure recovery. Lumière (20,) has advised the use of persulphate of sodium intravenously—it is given intravenously in 20 cubic centimeter doses of a 5 per cent solution, every morning and every evening. Its action is not specific for the toxin, and it has not been used enough, as yet, to enable one to pass judgment upon it.

The proper treatment of the wound is the *sine qua non*, and without it every other form of therapy is in vain (22). The principles of treatment may be laid down as:

1. Sterilization of the part;
2. Thorough opening of the wound in its whole breadth and depth;
3. Débridement — complete excision of every scrap of dead or infected tissue;
4. Sterilization of the wound;
5. Measures to keep it open. It must not be "packed," though gauze, preferably soaked in hydrogen peroxide, may be laid gently in it. It must not be tightly bandaged. Anything tending to close the wound, and shut out the air, must be avoided. The dressing should be renewed very frequently.

The use of the antitoxin opens up an almost limitless field for discussion, and we can do no more here than give general conclusions. On theoretical and experimental grounds we may state that the antitoxin does not pass to the central nervous system via the blood vessels, axis cylinders, or perineural lymphatics, nor does it pass to the cells of the spinal cord from the cerebrospinal fluid, when injected intraspinally (7). It apparently acts simply by neutralizing the toxin being formed, and that already circulating in the blood (22). Sir David Bruce, whose knowledge of the disease is probably greater than that of any other person, says that the antitoxin has no power of neutralizing toxin already fixed in the nervous system, and that if a fatal amount of toxin has been absorbed, no amount of antitoxin will save the patient's life (24). Roux and Vaillard agree with this (10). Dean (13) thinks that antitoxin injected intraspinally would probably be absorbed by cranial sinuses and meningeal veins, and find its way into the circulation rather than into the cells and pericellular spaces of the central nervous system. He found that 12 hours after intravenous injections of 30,000 units, both the cerebrospinal fluid and the blood contained an ample amount of antitoxin.

As to the method of administration, we at once run into argument. In 472 cases, in each of which only one route was employed, the British War Office (25) reports results as follows:

	Cases	Deaths	Mortality percentage
Intrathecal only	90	63	70.0
Intravenous only	31	23	74.1
Subcutaneous only	265	146	55.0
Intramuscularly only	86	34	39.5
	472		

Their conclusions are that the intraspinal method is of value chiefly in the very early stages; the intravenous carries with it too much danger of anaphylaxis and is not recommended; the subcutaneous and intramuscular have definite points of value. They do not, however, dictate any definite rules for administration.

Golla (26) as a result of experiments on cats and rabbits concludes that the intraspinal and intravenous methods are far superior to the subcutaneous. Ashhurst (23), Sir David Bruce (16), Sherrington (28), Nicoll (27), and most others advise large doses intraspinally, supplemented by other methods—mostly intravenous—though Sir David Bruce favors subcutaneous and intramuscular (16). We may quote the British War Office (25): "Attempts have been made to draw useful conclusions as to the best mode of administering the antitoxin, and the most suitable methods of dosage, but the interpretation of the results has proved extremely difficult, and we are not in a position to lay down precise rules on the subject. Three cardinal principles, however, are clear; the antitoxin treatment must be started immediately after the appearance of the first suspicious sign of tetanus, the dosage of the antitoxin must be high, and its use must be maintained well into convalescence."

Intracranial and subdural injections have been used in a good many cases, the most recent report and résumé being that of Eberle (29), but this method has not proved

itself to be of enough value to warrant its use. Injections directly into the nerve leading to the wounded part have been tried. This is a form of administration which cannot be advised as a routine measure, but cases may arise in which it would seem indicated.

The untoward effects of antitoxin are twofold:—first, the serum sickness, and, second, anaphylaxis. The serum sickness comes on in from 8 to 15 days after administration, is characterized by urticaria, general pains, moderate temperature, is present in greater or less degree in practically every case, and is in itself of no serious moment. Anaphylaxis, on the other hand, is very dangerous, though rare, and ordinarily does not occur unless about 2 weeks or more have supervened since the first injection. It comes on during the injection, or immediately after, and is characterized by collapse, changes in pulse and respiration, and at times coma. Its dangers are greater if the antitoxin is being given intravenously, as in this way the patient may be overwhelmed by a fatal dose before the danger signals are enough to give warning. In cases where anaphylaxis is feared, a test may be previously made by giving 1 cubic centimeter of the antitoxin subcutaneously and watching for reaction. One of our cases went into collapse from anaphylaxis while being given an intravenous dose, 12 days after the initial injection, but recovered on immediate cessation of the procedure. From the general experience of the great majority of men, it may be said that the danger of the occurrence of anaphylaxis, in the general run of cases, is very remote, and the objections to intravenous injection on this score are not valid.

REPORT OF OUR CASES

Since 1872 there have been, in the Massachusetts General Hospital, 116 cases of tetanus. During the past few years most of the cases have been under the personal supervision of the writer. The total mortality of these 116 cases has been 69.9 per cent. Antitoxin was first used in 1896; first, Gibier's preparation — a powder dissolved in water; next, Pasteur's antitoxin, and, later, that prepared by the state board of health. Previous to this our statistics include 20 cases, in which the mortality was 80 per cent; demonstrating that a certain number of cases of tetanus are going to recover, even if they never have specific treatment. Since 1896 we have had 96 cases with a mortality of 67.7 per cent — a drop from the preceding figure, but not a great one. However, as we follow the cases up to the present time, the mortality gradually gets less and less, as noted in these figures:

	Cases	Mortality percentage
Since January 1, 1900	89	65.1
Since January 1, 1910	45	57.8
Since January 1, 1916	25	52.0
In 1921	5	40.0

Thus we see that for some reason or other the mortality has steadily decreased, and we believe this is due to more intensive and intelligent administration of antitoxin. Of the last 5 cases, 1 had completely recovered from her tetanic symptoms, only to die of a bronchopneumonia. Of course this must be recorded as a tetanus death, but actually the tetanus had been cured, leaving the patient in such a weakened condition that she could not overcome the pulmonary involvement.

In all the cases since 1896 antitoxin has been used, the amount and method of administration being modified and perfected, if that word may be used, as our experience has increased. Three of our cases were treated by trephining the skull with direct subdural injection—all of these died. Three cases were treated with magnesium sulphate in conjunction with antitoxin, and of these three, two died. We could not see that the drug exercised any valuable therapeutic action. In two cases tetanus bacilli were isolated from the inguinal glands.

It has been generally accepted that the shorter the incubation period, the worse the prognosis, and that with an incubation under 10 days the outlook is of necessity very grave. We do not feel that this view is entirely justified. Of our recoveries the exact incubation period was noted in 27 cases, and in 10 of these it was under 10 days as follows:

	Recoveries
Incubation, 2 days	1
Incubation, 5 days	3
Incubation, 6 days	1
Incubation, 7 days	2
Incubation, 8 days	2
Incubation, 9 days	1

Thus it is clear that just because the incubation is short, the outcome is by no means hopeless; and the case should be taken in hand with all the more vigor.

Our last 5 cases, of which 3 recovered, are the most interesting ones, and brief reference will be made to them here.

CASE 1. A. K. School-girl, age 16, admitted December 16, 1921. Punctured wound of foot. Incubation of tetanus 7 days. Duration of the disease before entrance 24 hours.

The first symptoms were sore throat and stiffness in jaws and neck. Examination revealed a small slightly infected wound on sole of right foot; trismus; spasm of neck and abdominal muscles. Cultures of wound and spinal fluid negative for bacillus tetani.

Treatment:	Around wound	Intravenously	Intraspinally
December 16	1,500 units	20,000	10,000
December 17	.....	50,000	10,000
December 18	1,500 units	50,000	10,000
December 19	.....	50,000	.....
December 20	.....	30,000	.....
December 21	1,500 units	30,000	5,000

Total antitoxin 269,500 units.

The wound, on entrance, was thoroughly opened and cleaned, swabbed with iodine, and gauze soaked with hydrogen peroxide lightly laid in, and frequently changed. No bandage. She was given luminal in doses of 1 grain every 3 hours. On the 21st the tetanic symptoms and signs were rapidly receding, and recovery was looked for, but on the 22nd the temperature was higher, respiration was rapid and labored, and a diagnosis of bronchopneumonia was made. The spasm had let up to a degree that she was able to sit up with a head rest, and the neck was relaxed. She was taking fluids well by mouth.

On December 23, all tetanic signs had disappeared save for slight stiffness in jaws. On December 24 she became cyanotic, and there was dullness at both bases. In spite of all attempts at saving her she died December 26 at 3.02 a.m

This was a case which can fairly be said to have died, not of the tetanus *per se*, but of its complication.

CASE 2. E. T. A man, age 44, hostler, admitted April 22, 1921. Lacerated, infected wound over right tibial tubercle, from a horse kick. Incubation 13 days; duration before entrance, 4 days. First symptom—stiffness in jaw muscles. On entrance his wound was opened and cleaned out, but on the second day, the infection apparently having become worse, it was again, and more thoroughly, laid open and cleaned. After 2 days of extreme tonic spasms, with typical risus sardonicus, he began to improve. He was given in all 180,000 units of antitoxin, intraspinally, intravenously, and around the wound. He was given luminal, 3 grains every 3 hours. Spinal fluid and wound negative for bacillus tetani.

This case was not extremely virulent, but in the first 24 hours after entrance he became very much worse, and would probably have died without effective treatment. This was the first case in which we used luminal, and its dosage was high, but it had no untoward effect and we believe that it was of value.

CASE 3. A little girl, D. K., age 4, admitted August 16, 1921. Incubation not determined, as the exact lesion could not be ascertained—she had had numerous mosquito bites, which she had scratched. It was a typical tetanic case, never very severe, and recovered after the administration of 55,000 units of antitoxin, given as follows:

	Intraspinally	Intramuscularly	Intravenously
August 16	3,000	10,000	.....
August 17	.....	15,000	.....
August 18	.....	.....	17,500
August 19	.....	.....	5,000
August 20	.....	.....	5,000

CASE 4. C. C., a school-girl, age 7, admitted July 23, 1921. Punctured nail wound of foot. Incubation 8 days, duration before entrance, 2 days. A severe case, with opisthotonus and generalized muscle spasm. Total amount of antitoxin 141,000 units, given as follows:

	Intraspinally	Intravenously	Intramuscularly
July 23	3,500	8,500	.....
July 24	.....	11,000	2,000
July 25	.....	22,000	.....
July 26	.....	15,000	5,000
July 27	.....	20 000	.....
July 28	.....	7,000	.....
July 29	.....	10,000	.....
July 30	.....	10,000	.....
July 31	.....	7,000	.....
Aug. 1	.....	.....	10,000
Aug. 3	.....	10,000	.....

She was given luminal 1 grain every 3 hours. On entrance the wound was treated in the routine manner.

This was a severe case, in our opinion saved by the treatment.

CASE 5. K. H., a school-girl, age 7, admitted October 5, 1921, with an infected wound of the upper arm, received 3 weeks previously. Onset of tetanus 36 hours before entrance. Assuming the tetanus bacilli to have gained entrance at the time of the original wound, the incubation would be just under 3 weeks, but the virulence of the case makes us believe that the specific infection occurred at some later date, and the incubation period is considered doubtful. She entered the hospital at 1.25 a. m., with severe symptoms, the case seeming almost hopeless from the start. The wound was cleaned

out, and on that day she received 5,000 units intraspinally, 4,500 around the wound, and 40,500 intravenously. The next day, October 6, she received 40,000 intravenously, but failed rapidly, convulsions becoming more violent and of longer duration. She died at 11.22 p.m., having received 90,000 units.

This is one of the extremely virulent cases, which our present knowledge and methods have not yet enabled us to combat successfully.

Given a hundred cases of tetanus, a certain number, perhaps twenty, will get well anyway, with ordinary symptomatic treatment, and without antitoxin. A certain number, to which the author will not attempt to give a figure, will, in spite of the best treatment which our present knowledge enables us to give, die. Between these two groups lies the middle class of those who will die or get well according to their treatment, and by that treatment we mean the proper care of the wound, the intelligent use of sedatives, and the prompt, well-directed, and repeated use of large doses of antitoxin. The problem which must be solved if we would cure more cases is that of getting the antitoxin into contact with the toxin which has already invaded the nervous system. We are in the position of a general with a large, well-equipped army, who suddenly sees the enemy make a determined drive at some objective, and rapidly entrenches himself; the general launches his nearest troops in counter-attack, and brings up his reserves, but he has been unable to find out the best routes of advance, his troops wander and do not get at their own objective, and by the time he cuts the enemy's line of communication the position which he wanted to save has been destroyed. These routes we have not yet learned.

CONCLUSIONS

1. Prophylactic injection of antitoxin should be given, in civilian as well as war practice, in every case in which there is the slightest possibility of the development of tetanus.

2. Excision and débridement of the wound is the first essential. The wound must then be kept open—neither packed tight nor bandaged tight.

3. The use of magnesium sulphate and carbolic acid is of doubtful value.

4. Sedatives must be used as indicated, and though our experience with it has not been extensive, we believe luminal is a valuable drug and advise its use.

5. We advise antitoxin in large doses by the intraspinal and intravenous route, with small doses into the tissues around the wound.

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DEPARTMENT OF TECHNIQUE

BONE GRAFTING

By W. R. ADAMS, M.D., Savannah, Georgia

BONE grafting is indicated when it is necessary to stimulate osteogenesis in tuberculous joints, to repair injured bone, to replace bone destroyed by infection or malignancy, to supply congenitally absent bone joints, to correct congenital deformities, and to close bone foramina or trephine openings in the skull.

The first successful bone transplantation was done by Merrem in 1809. This work was done upon animals. Later, Ollier, in extensive work on both animals and man, found that fresh bony tissue with the periosteum intact gave the most successful results. This was in 1858. Hence we see that bone grafting is not new. Yet the men foremost in bone surgery today are not yet agreed as to just what takes place when living bone is transplanted: whether the whole graft lives, whether the osteoblasts are sent out by the periosteum or endosteum, or both, or whether the graft acts merely as a bridge and the osteoblast proliferates into it from the ends of the host bone. However, it is conceded by all that it is best to use an autogenous graft with the periosteum and endosteum, when possible.

Among the various kinds of grafts we have homoplastic, heteroplastic, and autogenous grafts; boiled bone; ivory pegs; screws; wire and metal plates. In this article I will discuss only autogenous grafts. Regarding foreign bodies in bone work, I would say only this that, in nearly all cases, to obtain union it is necessary ultimately to remove the foreign bodies.

Autogenous grafts are living grafts taken from the individual who is being operated upon. The autogenous graft is far superior to all others. Albee claims that union is secured in every case where the autogenus graft is used. In using such grafts it is best to have the periosteum and endosteum intact.

Since it has been the experience of most surgeons that any but the autogenous graft is apt to cause trouble as it acts as a foreign body and it is ultimately necessary to remove it to obtain union, and in view of the fact that under the proper technique we obtain 100 per cent cures in autogenous grafting, there really is but *one* operation of choice—the autogenous graft operation.

I shall consider only one form of graft—the intramedullary. The intramedullary graft is not so universally used as other grafts, but, in my opinion, we obtain just as good results with it and the technique of operation is more simple and the operation more quickly done. The real purpose of this article is to explain why the intramedullary method has been discarded by most surgeons and to present a technique which has given the desired result.

The method of intramedullary grafting that I am using is one that I have worked out myself, and if a similar operation has been described I have failed to see any mention of it in any journal or book on bone work. I have now done 75 intramedullary graft operations and have secured union in each case without any complications.

The technique of the intramedullary graft operation as used by Albee and other surgeons doing

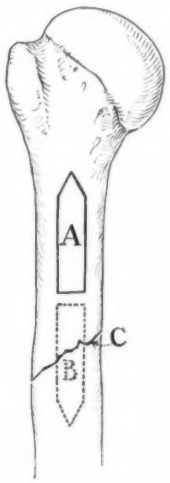

Fig. 1. *A*, Intramedullary graft cut out with Albee electric saw ready to be removed; *B*, intramedullary graft in medullary canal in proper position; *C*, line of fracture.

bone work may be described as follows: A small autogenous bone peg is cut, and one end of the peg is inserted into the medullary canal of the proximal end of the fractured bone. The distal end of the fractured bone is then tilted so as to insert the other end of the peg into the medullary canal of this, the distal, end of the fractured bone. This is rather a difficult thing to do, especially if two bones are fractured, as the tibia and fibula or the radius and ulna. Albee states that he has fractured the fibula while trying to insert the intramedullary graft into the tibia, and for this reason he has given up the use of the intramedullary graft. Also the graft is quite often broken, while attempting to insert it. So it seems that this technique is unsatisfactory and should be discarded.

The technique which I have worked out is as follows: The skin incision should not be made directly over the center of the bone to be operated on, but a little to one side. The fractured bone is exposed in the usual manner. The graft is taken from the fractured bone, either above or below the line of fracture, depending upon which would be the more practical, considering the location of the fracture, muscles, blood vessels, and nerves. If the fracture is an old ununited one, the fibrous scar tissue is cut away and the ends of the bone freshened by cutting off the fractured ends until the healthy bone is reached. If the fracture is a recent one, the muscle or any surrounding tissue that is between the ends of the fractured bone, is, of course, removed. One end of the exposed fractured bone is now tilted up so as to obtain the exact width of the medullary canal, and the twin saws of an electric bone outfit are set the exact width of the canal. With a knife the graft is outlined, cutting through the periosteum. The graft should be about 4 or 5 inches long and should not extend closer than within 2 inches of the fracture. The graft is cut with the twin saw. The ends, one of which is blunt, the other pointed, are cut with a single saw. The graft, which includes the periosteum and endosteum, is now lifted out. The pointed end is inserted into the opening from which the graft has been cut, is pushed into and down the medullary canal past the line of fracture, into the medullary canal of the other end of the fractured bone, so that 2 or 3 inches lies in the proximal and a similar length in the distal part of the fractured bone, thus bridging the fracture.

As the graft is the exact width of the medullary canal, it fits snugly and holds the fractured bones firmly and in good position. As the graft has both the periosteum and endosteum it makes no difference from which the osteoblasts proliferate.

If, by mistake, the graft has been cut too narrow and does not fit snugly in the medullary canal, drill 2 or 3 holes through the entire bone going through the graft, and pass kangaroo tendon through the holes, tying the graft in place.

All hæmorrhage is stopped, the muscles, fascia, and skin are closed in the usual manner, and splints or plaster are applied.

The after-treatment is the same as after any other bone transplantation.

It is not my idea that the intramedullary graft should be used in all cases where a bone transplant is indicated, as in many instances the inlay, peg, or other form of bone transplant is more applicable.

In fresh fractures operation should be done in 5 to 15 days, unless the fracture is compounded or infected. If infection is present operation should be delayed until all infection has been overcome, as it is difficult to obtain union in the presence of infection.

Following are a few case reports which show the results after operation in which my method of intramedullary graft was used.

CASE 1. J. R., age 17. Ununited fracture of 3 months' standing, upper third of right tibia. Operated on April, 1918. Muscle and scar tissue were found between ends of fractured bones. The tissue was removed, the ends of the bone freshened, an intramedullary graft inserted, and the leg put up in plaster cast. Result: perfect union and boy returned to work 7 weeks from operation.

CASE 2. W. B., age 34. Fractured left femur, middle third. Patient brought into hospital same day of injury, May, 1919. Leg was put up in extension for 10 days, with ends of bone still overriding. We decided open operation was necessary for complete reduction. Operation eleventh day after injury: intramedullary graft operation done, and leg put up in plaster cast. The cast was removed at end of sixth week, and patient walked at end of twelfth week. He has absolutely no shortening of leg.

CASE 3. V. T. Y., age 40. Ununited fracture of right radius 2 inches above wrist, 4 months' standing. The ulna was fractured at same time but had united. The lower end of radius was displaced and was bound down by a fibrous union to the ulna. The upper end of radius was free. Intramedullary graft operation was done April, 1917, and a plaster cast applied. Result: perfect union and patient was able to resume work 8 weeks after operation.

CASE 4. E. N., age 28. Right humerus fractured middle third, February, 1917. Four attempts were made to reduce fracture and X-ray showed each attempt to be a failure. An open operation to reduce fracture was done 10 days after injury. An intramedullary graft was inserted and the arm put up in plaster cast. Result: perfect union and patient returned to work 8 weeks after operation.

DAMPER GASTRO–ENTEROSTOMY

By J. CHRISTOPHER O'DAY, M.D., F.A.C.S., Honolulu, Hawaii

GASTRO-ENTEROSTOMY, performed as it usually is with clamps, often fails because of the sequelæ such a procedure invites. We refer in particular to postoperative hæmorrhage and those subsequent ulcers of the stomach that the pressure of the clampblades has been at times seemingly responsible for. Another postoperative disturbance that may give both patient and surgeon anxiety is the postoperative vomiting induced by regurgitated bowel contents. While such vomiting is due to the character of the anastomosis rather than to the use of the clamps, it is, nevertheless, fraught with dangers capable of thwarting the purpose for which the operation is originally undertaken.

Of all the postoperative sequelæ, however, hæmorrhage is to be feared the most because it is not likely to begin until after the patient has been returned to bed where, in the absence of the surgeon, it is not recognized until loss of blood has, stealthily, carried him into the realm of shock, perhaps death. Indeed, it was just such an occurrence that prompted Robert C. Coffey to work out his no clamp gastro-enterostomy.

While the clamps we had always used were of very light and flexible blades, two of our cases developed ulcer of the stomach in that portion of the mucosa where the blades had pressed during the operation. Because of these two unwelcome sequelæ, the Coffey procedure attracted our interest. We soon realized, however, that an unfair risk would be unjustly imposed, should it be attempted on a fellow-being without first having mastered its every detail on a number of the lower order of animals. Following the advice of Coffey, we carried out a number of such experiments, but, before doing so, we had several opportunities of seeing the operation performed by its author.

Finally after we had sufficient experience to warrant our applying this splendid procedure to our regular work, we soon found that the entire period of postoperative convalescence was markedly free from all the disagreeable features of the old clamp technique. The vomiting we attributed to the welt which the second or through-and-through line of sutures produced, and when the "Coffey welt," of his no clamp gastro-enterostomy, was known to be the moderator of the intestinal regurgitation, the suggestion came to us of converting the welt into a damper by enough additional sutures to fuse the half of the jejunal circumference to the wall of the stomach.

After a number of experiments, the operation described here was perfected. Those familiar

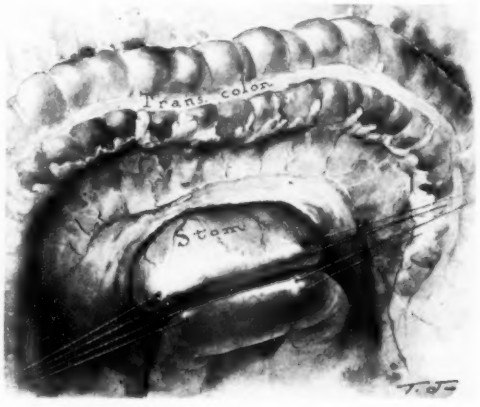

Fig. 1. The stomach is made to herniate through the transverse rent in the mesocolon, the jejunum is rotated downward and the traction loops in place.

Fig. 2. A seromuscular stitch brings the stomach and the jejunum together and the traction loops are tied over the seam.

Fig. 3. The second or through-and-through line of suturing, sewing to the internal margins of the traction loops, is begun in such a manner that corresponding portions of stomach and bowel are lifted into two distinct welts which come together and cover the first line of approximation.

Fig. 4. Nearly one-half of the circumference of the jejunum is fused by suture to the posterior wall of the stomach. The line of stitching that shows is a seromuscular one. The second, or through-and-through, line is directly beneath it. This stitch completes the construction of the damper. When the opening into the stomach and bowel has been made it is covered by sewing the two inner free edges over it and thus making the mucous covering of the damper continuous.

with the no clamp method spoken of above will readily recognize the modification we have given it, and while the regurgitation of the bowel-contents was the thing we set out to prevent, unwittingly another of the disagreeable post-operative sequelæ was, by the construction of the damper, prevented, namely postoperative jejunal ulcers that always involve that portion of the jejunal mucosa where the chyme jets straight through the unguarded opening of a clamp made anastomosis.

Properly performed then, we are convinced that damper gastro-enterostomy will entirely do away with all those menacing postoperative features of the earlier operation: retarded hæmorrhage, ulceration of that portion of the stomach wall pressed by the blades of the clamps, regurgitation of bowel-contents, and ulceration of the jejunal wall where it is forcibly struck by the chyme.

TECHNIQUE OF OPERATION

The rent in the transverse mesocolon is made parallel to the transverse colon instead of at right angles to it, and the stomach is allowed to herniate until the vessels of the lesser curvature have been brought into view. The rent is best effected by tearing gently with the fingers, for in this way adjacent vessels will be drawn, intact, to the lateral margins and conserved, while at the same time the artery colica media is protected against the likelihood of injury.

With the posterior wall of the stomach thus exposed, the lower margin of the rent may be tacked to it by three or more interrupted sutures. The traction loops, penetrating the four coats of the gastric wall, are then placed in such fashion that toward the greater curvature surface sufficient to fuse the half of the jejunum's circumference will be insured.

The jejunum is then sought and brought forward in the usual manner, and when the duodenojejunal junction has been identified, the no-loop portion is made to parallel the line of the traction and then rotated downward until its mesenteric border becomes adjacent to the stomach. Just above this mesenteric border of the jejunum the second pair of traction loops are placed, but it is well to bear in mind that, owing to the valves of Kerkring (*plicæ circulares*), the jejunum, at rest, especially at its no-loop portion, is so contracted that unless the loops be placed closer together than they had been in the stom-

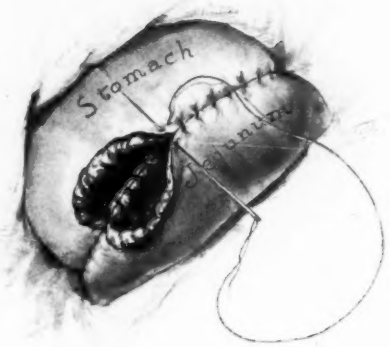

Fig. 5. Partially schematic to show damper rising, partition-like, between the cavity of the stomach and that of the jejunum.

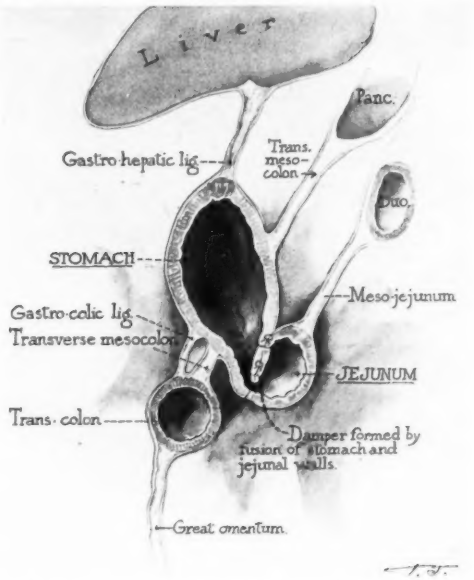

Fig. 6. Diagram showing relation of viscera when operation is complete.

ach, equidistance will not obtain when the two viscera are drawn together for stitching. The loops in the jejunum should be no farther apart than the two-thirds of the distance between those in the stomach.

By gentle traction, the assistant then draws two ridges of the viscera together; through these the sero-muscular line of suturing is carried. Beginning about the half of an inch outside the loops, the stitching is carried toward and between them. When finally it emerges from between the second pair to a point about the same distance beyond, each set is tied snugly over the seam. The needle is put aside, still threaded, until the finishing stitch of the anastomosis is to be made.

The second suture will include all the coats of both stomach and bowel. It is placed in the following manner: The needle is plunged into the jejunum about the third of an inch away from the first row of stitching. With its point within the lumen it is turned toward the stomach to emerge at a point about midway to the seam, then over the seam to enter the stomach and then out from the stomach at a point directly in line with the point at which it first entered the bowel. A tie will draw two distinct welts in each and facilitate the completion of this second or through-and-through line of suturing.

Like the first, the third suture line is seromuscular. When it has been completed, the opening into the two viscera is made. Mucosa of stomach and that of jejunum approximated along the crest of the damper completes it. From this point on, the operation is completed as it is in the clamp operation with but two rows of suturing. Beginning at the opposite angle from which the first line was started, a through-and-through stitch is carried to the point at which the first needle was put aside. Here again it is taken up and buries the stitch just taken beneath a seromuscular one across to the point where a free end designates its beginning. A knot with the free end completes the operation.

THE PROSTATIC PROBLEM[1]

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THE purpose of this paper is neither to draw comparisons between the various methods of performing prostatectomy nor to laud any particular method to the exclusion of all others, but rather to bring before you some of our efforts to simplify the treatment of this common condition.

Each method has, at the proper time and in the proper hands, its own peculiar virtues and uses, and in a well-equipped department of urology, with an efficiently trained personnel, such as are seen in the large hospitals of today, no one method of dealing with the question of prostatectomy should be adhered to to the exclusion of all others. We have come to realize in our teaching, both under-graduate and graduate, that the exigencies of general medical or surgical practice do not allow the time or afford the opportunity for mastering the techniques of the various methods of performing prostatectomy.

With this in mind, we have attempted in the past few years in the Department of Urology of the Royal Victoria Hospital to perfect, and above all to simplify a method of prostatectomy which will give the safest and most satisfactory results. The operation that fulfills the three requisites of simplicity in management, ease and safety in performance and satisfaction in the final result is, we believe, the so-called two-stage suprapubic prostatectomy. Below will be described the routine, technique, and management used in this class of cases in the Department of Urology in the Royal Victoria Hospital.

On admission to the Department a searching history is taken with particular elaboration of the symptoms referable to the genito-urinary system. These symptoms are frequency, dysuria, hæmaturia, and alteration of the urinary stream. The frequency of urination may be day or night; more often it is nocturnal. Frequency was noted in 90 per cent of our cases and it formed the first symptom noted by the patient in 78 per cent of the cases. Painful urination is at times a prominent symptom.

Contrary to the almost universal belief hæmaturia is not so prominent a symptom in carcinoma of the prostate as it is in prostatism—the benign prostate. This is caused by the congestion and erosion of the prostate and vesical neck in prostatism.

A prominent symptom nearly always, is alteration of the urinary stream. The patient notices that for some months or even years the urinary stream has gradually become smaller and that he has to strain to start his flow. He has also since this began, become the victim of hæmorrhoids or hernia. This condition continues until one day after catching cold or after some other indisposition he is unable to void at all. He has his first attack of retention and he requires to be catheterized. He may recover and he may have several such attacks, from all of which he survives. But sooner or later he will not recover.

Always there is close questioning of the patient regarding his general health—appetite, sleep, headaches, constipation, bad taste in the mouth and dry tongue, torpor, loss of weight and strength—all pointing to a general intoxication due to impaired renal function.

The onset of symptoms varies considerably. Usually it is over a long period of time. The average onset of symptoms before admission, in our series, was 5½ years, the longest 32 years. It may be quite short, especially in the early cases.

Next, a complete physical examination is made to include exploration of the urethra, determination of prostatic obstruction, amount of residual urine and estimation of the extent of prostatic involvement, per rectum. Not unimportant is the estimation of the blood pressure, which not infrequently is quite high and falls 20 to 30 millimeters of mercury upon relief of retention. Repeated urinalyses are done: 90 per cent of these cases of prostatism show the presence of infection by pus and blood in the microscopic specimen, often the specific gravity is low.

Then comes the repeated estimation of the renal function by the phenolsulphonephthalein test:

	Percentage
Normal average: first hour reading....	50 to 60
Normal average: second hour reading.	25 to 30
Normal average: two hour reading...	75 to 85

In cases of prostatism our findings have been:

	Percentage
On admission average two hour reading..	35
After drainage average two hour reading..	52
On discharge average two hour reading...	57

[1]Read at the Canadian Medical Association meeting, Winnipeg, June 23, 1922.

The urea, uric acid and creatinine contents of the blood are taken at intervals coincident with the estimation of the phenolsulphonephthalein tests. The findings here, for the most part, parallel those of the latter. The normal contents of the blood may be said to be:

Blood urea 0.35 gram per litre of blood.
Blood urea nitrogen 12 to 18 milligrams per 100 cubic centimeters of blood.
Uric acid 1.5 to 3.5 milligrams per 100 cubic centimeters of blood.
Creatinine 0.7 to 1.5 milligrams per 100 cubic centimeters of blood.

Blood findings in cases of prostatism:

	Percentage
Cases showing only blood urea retention	46
Cases showing blood urea and uric acid retention	24
Cases showing blood urea, uric acid and creatinine retention	40
Cases showing normal blood urea, uric acid and creatinine content	26

The blood urea is the first element of the blood to be affected, followed by uric acid, with creatinine the last to be elevated beyond normal limits; when this last occurs it is an indication of severe degree of impaired renal function and indicates a poor or at least guarded prognosis. This is particularly true when the creatinine content remains fixed or moves but little toward the normal limit even after prolonged catheter or suprapubic drainage. The phthalein test is the simpler and gives a quite satisfactory indication of the functional condition of the kidneys. Just here it is well to state that though we consider the laboratory findings of prime importance, not less do we estimate the clinical and physical condition of the patient. Each must supplement the other, else the surgeon finds he is going astray.

Every case is roentgenographed for the presence of stone, vesical or renal. Cystoscopy is performed in selected cases to determine or verify presence of stone, extent of intravesical enlargement of the prostate, and presence of vesical diverticula.

Should there be residual urine, which occurs in 80 per cent of the cases, either an indwelling catheter is placed in the urethra, when tolerated, or the patient is catheterized every 8 hours until such time as suprapubic cystotomy is performed. The average drainage in this manner has been 5 days; however, suprapubic drainage can be done at any time, the sooner the better. It is freer than catheter drainage and less likely to go wrong or lead to the annoying complication of epididymitis.

THE SUPRAPUBIC CYSTOTOMY

Our routine wash-up has been soap, water, and alcohol. The bladder is filled comfortably with warm boric solution or distilled water. Local anæsthesia, anocaine 1 per cent, novocaine 1 per cent for the skin and ½ per cent for the deep tissues, is used. Infiltration is done slowly, care being taken that there is no pain nor shock. The virtue of the local anæsthesia is that it can be done leisurely; there is no drain on the already much overworked kidneys. Infiltration can be done with the patient anywhere, in his bed or on the kitchen table. The skin and deeper tissues are infiltrated from just below the umbilicus to well onto the symphysis pubis. A median suprapubic incision is made along the line of infiltration. This gives a long incision and it is purposely so, so that we may see and handle easily those structures we have to deal with. The rectus sheath is incised practically the length of the incision; the recti are separated and retracted. The peritoneal fold with its layer of preperitoneal fat is infiltrated just at the symphysis pubis, and by careful dissection is retracted upward. Not infrequently this fold of peritoneum is low and may be adherent to the pubic bone which brings forcibly to mind the folly of suprapubic puncture with trocar and cannula. The fold is retracted as high as possible, during which the bladder becomes exposed. The bladder is infiltrated at its highest point, incised, and the contents evacuated by suction; and then explored for calculi, and to determine the exact size of the gland and nature of the obstruction. At this point we have been in the habit of putting in what is called an "anchoring suture." Heavy catgut on a fair-sized curved needle is used. The suture is placed at the level of the vault of the bladder and goes through the rectus fascia and the rectus muscle of one side, takes a firm bite into the musculature of the bladder at the vault, and comes out through the rectus muscle and rectus fascia of the opposite side, at the corresponding level. This suture is tied later and anchors the bladder securely to the anterior abdominal wall, thus preventing herniation of the peritoneal fold into the wound. Next is the insertion of the so-called Pezzer catheter No. F 36 or whatever size is thought advisable. If necessary the bladder is sutured firmly about the tube which is drawn snugly against the vault of the bladder so that the "mushroom" fits firmly against the bladder wall.

Before closure proper drainage of this tube is seen to. Closure of the wound is by catgut suture for muscle and fascia. Before the skin sutures are placed the "anchoring suture" above mentioned is securely tied. A prevesical drain of iodoform gauze or cigarette drain is placed in the space of Retzius. Skin closure is with silkworm by mattress suture. The wound is dressed.

Postoperative care following cystotomy. Dressing of the wound with alcohol dressings; through the suprapubic tube the bladder is irrigated daily with mild antiseptic solution, as boric, or if there is much pus and mucous 1:10000 silver nitrate solution is used. If the urine has been alkaline, encrustation of the drainage tube may take place. This is obviated by the daily bladder irrigations and by rendering the urine acid by the administration of acid sodium phosphate solution and urotropin. In case there is encrustation of the tube with urinary salts, which might occur in 4 to 6 days, and the drainage is not sufficiently free, the tube is removed, cleaned, sterilized and reinserted, or an *I* tube is put in instead. Either is easily inserted as a firm sinus has by this time formed. Sometimes the tube is not reinserted, should the patient be in proper condition for prostatectomy in a day or two. Usually the tube need not be removed; it may remain comfortably *in situ* for months if necessary, with proper care.

We have abandoned the continuous irrigation and the syphon drainage. The Pezzer catheter drains into an urinal or a wide-necked 8 ounce bottle. This drainage is more simple, more efficient, and certainly more comfortable for the patient. It allows him freedom of movement in bed without the likelihood of disarranging apparatus or of breaking the syphon suction.

Our statistics show that with the use of the indwelling catheter the most frequent and annoying complication with which we have had to deal is epididymitis. The pathology of this condition will be readily remembered when one considers that nearly always the vesical neck and prostatic urethra are the seat of infection and that it requires but a slight exciting factor, such as the moderate traumatism from catheterization, squeezing scrotum and contents between the thighs, low hanging scrotum, etc., to cause the epididymis to flare up with an acute pyogenic infection, either through direct extension or lymphatic absorption. We, therefore, have applied to all cases a method of suspension of the scrotum by means of a T-binder and pads in the perineum to build up a nest in which the scrotum and contents lie suspended. Since using this technique epididymitis has been very rare.

WHEN SHOULD THE PROSTATE BE REMOVED?

This important question naturally comes to mind, and here, we think, is the kernel of the whole problem of prostatectomy. It is not so easily answered as asked. A number of conditions must be considered: the urine, the renal function, the blood nitrogen retention, and not least the general clinical and physical condition of the patient. Each taken separately cannot form a criterion upon which to base a judgment; all must be considered.

In our series, after instituting suprapubic drainage for a period of 10 days or 2 weeks, the specific gravity of the urine rose from a low point to normal or nearly normal, the dry tongue became moist, the sallow skin cleared, the mentality became more acute, the appetite improved; in fact there was marked advance in the general condition of the patient.

There need never be any hurry to perform the second stage—the prostatectomy; indeed, the suprapubic drainage may be kept up for months if need be, or until such time as the patient is in condition for the prostatectomy. Herein lies the value, the safety of this method, for the general surgeon, for the general practitioner, for the man who has not at hand all the facilities of the large modern hospital, who has not at his call trained help, who has not specialized training required for other methods of prostatectomy.

THE PROSTATECTOMY

The second stage, the enucleation of the prostate, is performed under gas anæsthesia; rarely is ether anæsthesia used. However, ether anæsthesia is not contra-indicated, provided it be light, just sufficient to cause relaxation, and short, and the general condition of the patient warrants its use.

With two fingers of one hand in the rectum, so as to bring the prostate upward into the bladder, it is enucleated by the gloved finger of the other hand through the suprapubic sinus. The finger is pushed firmly and gently into the prostatic urethra, which is thereby ruptured on the roof; then thorough enucleation is done along the natural line of cleavage, until the entire prostate, except the posterior lobe, which alone remains, is freed and pushed into the bladder through the opening in the prostatic capsule. There are some who militate against the use of the finger in the rectum; they claim that this forms a fixed point against which one works, and that thus there is danger of rupturing into the rectum; this danger, we think, is slight, whereas the aid that comes from the finger in the rectum is real.

Thoroughness of enucleation is sought rather than any record for rapidity of enucleation. The hyperplastic prostate generally is quite large and easily enucleated, while the fibrous type takes more time and care, being small, hard, and adherent. This latter often requires the use of the prostatic rougeur and in this case the rectal finger again acts as a distinct aid and guard.

After enucleation the prostate is free in the bladder and is removed through the sinus by means of a sponge forceps. The prostatic cavity is thoroughly examined with the finger for completeness of enucleation. Nothing further is done to it.

A moderate amount of bleeding always follows prostatectomy; this comes from the prostatic plexus of veins. It is well to consider, at this juncture, the question of postoperative hæmorrhage. This complication, following prostatectomy, we consider is caused by two things, either by an inherent tendency in the patient to bleed or by the fact that the operator has gone outside the prostatic capsule and natural line of cleavage and has ruptured an artery. The bladder of course should be kept empty, and not allowed to fill with blood-clot. In our series, post-operative bleeding sufficient for packing or any other method of hæmostasis has occurred but twice, and always in the one-stage cases. Bleeding in nearly all cases has been so slight that this has led us to adopt what we consider a considerable advance in the simplification of the management of these cases. We have abandoned catheters, tubes, packing and all method of drainage, except the suprapubic sinus itself following prostatectomy. Whatever clots form at the time of operation are removed with the sponge forceps. The wound is dressed; no tube is placed, no packing inserted. The wound is not sutured.

In the ward, whenever clots form, the nurse in charge of the case lifts away the dressings and gently picks them out. As long as clots form, they are removed and care is taken that the bladder is never full of them, as this would cause the bladder to become distended; it would contract to empty itself and thus cause more bleeding. If the bleeding is too severe and free, a Freyer tube is inserted, and, through this, clots are removed as they form.

Two factors, we believe, have influenced post-operative bleeding in our series of prostatectomy. One is the natural subsidence of the congestion and acute inflammation of the prostate and vesical neck consequent on the institution of suprapubic drainage, and the other is the hæmostatic action of normal horse serum. We have in all of our cases administered subcutaneously, 10 cubic centimeters of horse serum the afternoon previous to prostatectomy. This seems to have had a definite influence in lessening hæmorrhage. In addition, before and after the operation, we administer by mouth, calcium lactate, 20 grains, every 2 hours; this latter acts as a hæmostatic only during the period of actual administration.

Postoperative care after prostatectomy. On arrival in the ward a nurse is detailed to the patient. It is her duty to dress the wound whenever necessary and to remove with sterile sponge forceps the clots that form. The forceps is gently inserted into the sinus and the clots are picked out. Usually, in 12 hours the bleeding has become so slight as merely to stain the dressings, and no further clots come away. The dressings are changed whenever necessary, at least every hour, and they are so arranged that only the dressings immediately in contact with the wound are changed, or only so many as need be. The bladder is left untouched for a period of 3 or 4 days, at the end of which time the first bladder irrigation is performed by means of a catheter through the suprapubic sinus—mild boric or mild silver nitrate solution being used. Following this there are daily bladder irrigations and after 7 to 10 days irrigation may be done by catheter *per urethram*.

Care of the wound is an important business. There is nothing except prostatic obstruction, due to slough, granulation tissue, or the prostatic capsule forming an obstructing ledge, which will more readily delay healing than a dirty wound. The wound is kept clean, first of all by keeping the urine acid; an alkaline urine will speedily form dirty, filthy encrustations and slough on a wound otherwise perfectly healthy. We administer acid sodium phosphate, and see that the patient drinks freely of water and other liquids. Should the wound become encrusted with salts or should the edges become sluggish, silvol crystals applied directly will clean the wound and give a healthy granulating base more quickly and with less discomfort than anything else. The surrounding skin is kept clean and free of urinary salt deposit by means of ointment-vaseline or boracic acid and by frequent dressing. Exuberant granulations are curetted or cut away. The surgeon must remember that the suprapubic wound to be permanently healed must heal from the bottom outward and his efforts should be so directed.

After the sinus has become smaller, healing may be hastened by the use of Biers cupping for 10 minutes twice daily. The suprapubic wound will heal, if it is healthy, if it is kept clean, and if there is no obstruction at the vesical neck or in the prostatic urethra. It may be necessary at the end of 2 or 3 weeks to verify the patency of the

urethra or vesical neck by the passage of the urethral catheter or urethral sounds, if the first two conditions obtain.

Should the suprapubic sinus persist it can be readily closed under local anæsthesia by purse-string suture about it after excision of all scar tissue; and then by folding over succeeding layers of healthy tissue to reinforce the primary line of suture. An indwelling catheter can be placed to insure proper healing, but is not always necessary.

In reviewing our statistics on prostatism a number of interesting facts come to light. During the past 5 years, we have performed the following:

Type of Operation	No. of Cases Operated	Deaths	Mortality Percentage
Perineal	5	0	...
One-stage suprapubic	57	2	3.5
Two-stage suprapubic	158	3	2.
Suprapubic drainage only	6	3	50.

Of the deaths in the one-stage cases, one occurred in an osteomyelitis of the tibia from embolus, 22 days after operation; the other from pneumonia, 14 days after operation. All deaths have been from causes outside the genito-urinary system. Pneumonia in the more aged patients, acute cardiac dilatation and cerebral thrombi. No deaths were due to uræmia, formerly the cause of the extremely high mortality rate in the early days of prostatectomy.

The high mortality rate in those cases where suprapubic drainage alone was instituted was due to the fact that all these cases were admitted to the department *in extremis*.

Number of days in the hospital:

1. Perineal prostatectomy:
   Average 81 days } All complicated cases with prognosis bad
   Shortest 65 days } All complicated cases with prognosis bad
   Longest 92 days } All complicated cases with prognosis bad
2. One-stage suprapubic prostatectomy:
   Average 45 days
   Longest 95 days
   Shortest 30 days
3. Two-stage suprapubic prostatectomy:
   Average 50 days
   Shortest 24 days
   Longest 115 days

Number of days' drainage between first and second stage in the two-stage cases:

Average 17 days
Shortest 3 days
Longest 65 days

Average number of days of drainage before prostatectomy:

Perineal 10 days
One-stage suprapubic 11 days
Two-stage suprapubic 22 days

Average number of days before patient is dry and remains so after prostatectomy:

Perineal 50 days
One-stage suprapubic 26 days
Two-stage suprapubic 22 days

CONCLUSIONS

That for the general practitioner and general surgeon the two-stage suprapubic prostatectomy is the safest and simplest method of performing prostatectomy.

That adequate, even prolonged, catheter or suprapubic drainage before prostatectomy is essential.

That the clinical and physical condition of the patient and the laboratory findings together must form the basis for a judgment as to time for removal of the prostate.

That postoperative hæmorrhage following suprapubic prostatectomy by the two-stage method is rare.

That tube drainage following prostatectomy is unnecessary.

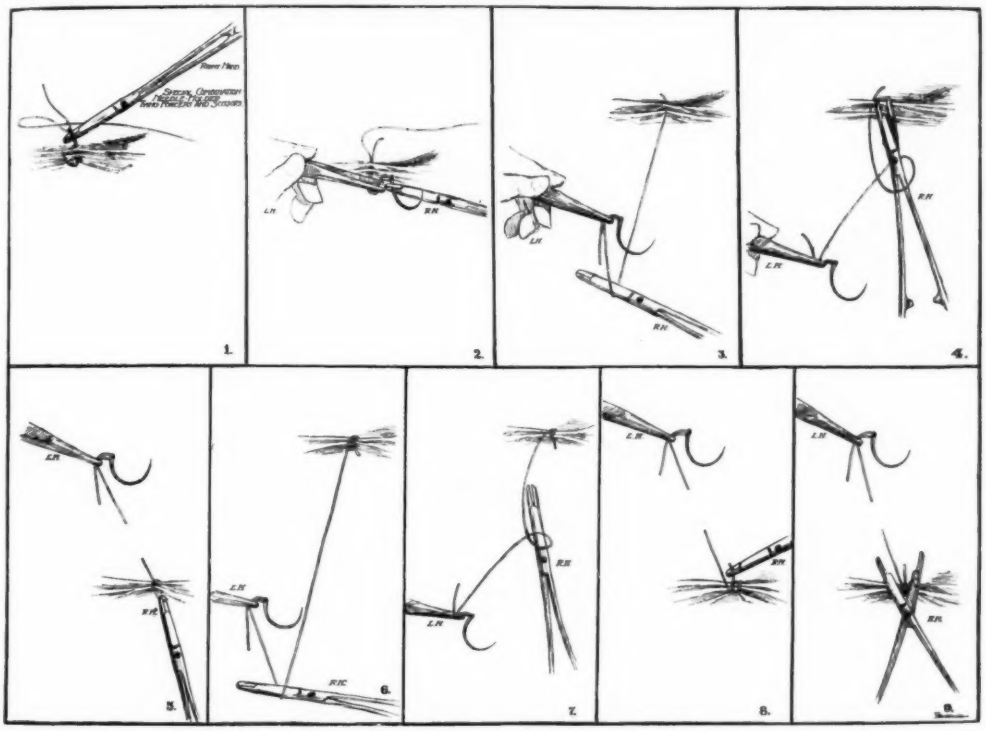
That the simpler the technique and management of prostatectomy is made, the safer it becomes for patient and surgeon.

NO-HAND-TOUCH TECHNIQUE

By A. R. GRANT, M.D., F.A.C.S., Utica, New York

A REHEARSAL of the details necessary to perfect a no-hand-touch technique resolves itself into the possibility of tying knots and ligatures without touching gloves to needle or thread. The accompanying illustrations are self-explanatory and define a method that makes it easy for surgeons, even with limited assistance, to operate upon a joint or a bone without hand contact. While it is easy to make encircling ligatures around clamped vessels, as described in Surgery, Gynecology and Obstetrics, May, 1918, it is my opinion that transfixion ligatures are better.

In our service in France, transfixion ligatures were undoubtedly the reason for almost no post-operative hæmorrhages and would become adopted as standard technique had hostilities continued.



TECHNIQUE

The instrument nurse threads the needle with sterile forceps not touching the gut nor the needle with her gloves.

The surgeon transfixes the tissue, pulls the needle through with needle holder and catches both strands of the suture near the needle with dissecting forceps in the left hand; he pulls on the left end with the left hand forceps until the right short end is only one-half inch from the point of transfixion. The long end should be proximal and the short end distal to the operator.

He lays the point of the needle holder across and on top of the suture just below the tips of the dissecting forceps and makes a loop around the needle holder.

He catches the short end of the suture with the needle holder, keeping its tips close to the site of the knot, while the left hand pulls the first half of the knot tight. He places the tips of the needle holder beneath suture and makes a second loop which completes the reef or square knot.

Note that the needle holder has been placed above the suture in Figure 3 and beneath the suture in Figure 6, a procedure that insures a square knot.

Any needle holder of the Mayo type is best adapted for this method of tying. I have had an instrument made that is a combination needle-holder-tying-forceps-scissors; it is useful to surgeons working alone or with limited or untrained assistants. This instrument is not original with me, for Marion Syms used a similar type 30 years ago and Trendelenburg used a larger affair. Dr. George W. Roberts, of New York, improved the model and curved its tips. The instrument here illustrated has special jaws capable of holding needles and also firmly grasping the finest gut.

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PITUITRIN IN THE THIRD STAGE OF LABOR[1]

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THE third stage of labor, though short in duration, carries with it great responsibility for the conscientious obstetrician. He realizes that in this brief period accidents sometimes occur that prove fatal or that lay the foundation for a prolonged and troublesome convalescence. All textbooks on obstetrics emphasize the importance of the careful and skillful management of this stage of labor.

In managing the third stage, the obstetrician strives to reduce the loss of blood to a minimum and to make sure that the uterus is completely emptied and properly contracted and retracted. Several methods are recommended to accomplish these objects. At one extreme is Ahlfeld's policy of strict non-interference, the expulsion of the placenta being left entirely to nature. At the other extreme is Credé's method of forcible expression of the placenta during the first afterpain. American textbooks advocate a middle course, advising watchful waiting, combined with gentle manipulation for 20 or 30 minutes, to be followed by Credé's manual expression. An excerpt from Edgar's *Obstetrics* may serve as an example of textbook teaching in regard to the conduct in the third stage of labor. "The physician or nurse continues by gentle pressure on the fundus to keep up and encourage firm, tonic uterine contractions in order to prevent hæmorrhage and the formation of an intrauterine clot. . . . It may be necessary to use gentle friction by circular motion with the hand, ... or it may even be necessary to grasp the fundus vigorously and subject it to active manipulation to get a prompt response. . . . Usually placental separation takes at least one-half hour. . . . For this period the uterus should be kept under manual observation. If the placenta is not expelled from the uterus at the end of this time, Credé may be resorted to. . . . After the delivery of the placenta the physician or nurse continues to hold the fundus in the hand for an hour." However, even though the obstetrician conscientiously desires to carry out the detailed instructions of the textbook, he frequently finds it next to impossible, especially in cases occurring outside of the hospital and under more or less unfavorable circumstances, such as poor surroundings and inadequate help. At times, the physician must cope with the situation single-handed. Even in the well-regulated hospitals, the obstetrician may be so pressed for time that he disregards the policy of watchful waiting. As a consequence, gentle massage gives place to rough handling, and Credé is resorted to prematurely and sometimes improperly. The result is excessive and unnecessary loss of blood, a traumatized uterus, and troublesome convalescence.

To ascertain whether the third stage of labor can be conducted, under all circumstances, in a simpler and safer manner, I experimented with pituitrin.

The nature of the physiological action of this drug recommends it for use in the third stage of labor. The action of pituitrin on the uterus consists (1) in increasing the frequency of uterine contractions, (2) in augmenting the strength of the individual contractions, and (3) in heightening the tonicity of the uterus.

If a dose of pituitrin is given immediately after the expulsion of the fœtus, the uterus begins to contract about 3 minutes later, the contractions come on at intervals of 2 to 3 minutes, the individual contractions are strong and well sustained, the placenta is expelled in a short time, and the uterus remains firmly contracted and retracted.

For more than 2 years I have been using pituitrin as a routine at the beginning of the third stage of labor in all my obstetrical cases and have found the results to be most gratifying.

In March, 1921, with the approval of the Medical Board of the Jewish Maternity Hospital, the routine use of pituitrin at the beginning of the third stage of labor was introduced in the public wards of the hospital, and the effect of pituitrin on the third stage was carefully observed and recorded.[2]

The following is a report of the procedure adopted and of the results observed in the first five hundred consecutive cases:

As soon as the fœtal head emerged from the vulva, the patient received 0.5 cubic centimeter of pituitrin (B. W.) by hypodermic injection, and observations were made as to the frequency

[2] The work was conducted with the kind permission of Dr. Druskin and Dr. Ratnoff. Dr. Druskin in 1914 observed the action of pituitrin in the third stage of labor. In his article "Pituitary Extract in Obstetrics" we find the following statement: "As the third stage of labor is always shortened by the use of this preparation, no Credé or manual separation of the placenta should be attempted without a trial of pituitary extract."

[1] Read before the New Utrecht Medical Society, April 17, 1922.

of uterine contractions; the number of contractions required to expel the placenta from the uterus; the time elapsing from the moment pituitrin was given until the placenta escaped from the uterus; and the amount of bleeding before and during the expulsion of the placenta. After each contraction the medical attendant sought for the well-known signs indicating that the placenta had left the uterus and had descended into the vagina, namely: (a) the uterus rising up in the abdomen and becoming flattened pear-shaped with a rather sharp ridge at the fundus, (b) the appearance of a soft boggy mass just above the symphysis and below the firm body of the uterus, and (c) the cord at the vulva remaining stationary when the fundus is gently pushed back. As soon as these phenomena were definitely and unmistakably recognized, the attendant placed his outstretched hand on the abdomen just above the fundus, spanning the recti muscles, and the patient was instructed to bear down. This, without squeezing or pressing the uterus, brought about the expulsion of the placenta from the vagina, and terminated the third stage of labor. The patient was then made comfortable and left on the delivery table for an hour, during which time the condition of the uterus and the amount of bleeding were watched and recorded. At the end of this period the patient was taken to the ward. During the 10 days' stay in the hospital observations were made regarding the amount of bleeding during the first 24 hours, the absence or presence of after-pains and their character, the character of uterine involution, and the amount and character of lochia.

Of the 500 consecutive cases observed there were primiparæ, 156; multiparæ, 344; spontaneous births, 450; breech cases, 11; transverse, 1; face, 5; brow, 1; twins, 8; hydramnios, 2; prolapsed cord, 3; versions, 7; forceps, 33; anæsthesia, 42.

Normally, after the expulsion of the fœtus, the unaided uterus remains quiescent from 5 to 20 minutes before it begins to contract again. The contractions occur at intervals of 4 or 5 minutes. On the average it takes about 25 minutes for the placenta to be completely separated. In the 500 consecutive cases in which we used pituitrin in the beginning of the third stage, the average period of rest of the uterus was 3 minutes. The contractions came on at intervals of 2 to 3 minutes. The average number of uterine contractions preceding the signs of placental expulsion from the uterus was two. The average duration of the third stage was 7 minutes. In only one case was the placenta retained due to a spasmodic contraction of the internal os. After waiting 3½ hours, anæsthesia was administered and the placenta dropped into the vagina. In this case the retention of the placenta was probably due to premature and perhaps improper manipulation of the uterus. Manual removal of the placenta was done three times, after the lapse of 4 hours, 6 hours, and 1 hour respectively, the last case giving a history of manual removal of the placenta in the previous pregnancy. In all three cases the cervix was found to be open, and the hand could easily pass up into the uterus. In two of the cases the placenta was found unseparated, but was easily peeled off from the uterine wall, and delivered complete. In the third case there was an unseparated placenta succenturiata in the right cornu of the uterus.

Immediately after the expulsion of the placenta the uterus contracted firmly and stood out prominently. In the overwhelming majority of the cases, while the patient remained under observation for an hour on the delivery table, this state of firm contraction was uniformly and continuously maintained. In only fifteen cases the contraction of the uterus was not well maintained. In these instances the patients received ergot in addition.

After the delivery of the placenta the bleeding was in most instances so slight that the vulva pad applied immediately after the completion of the third stage of labor, was at the end of an hour only slightly tinged. In ten cases the bleeding necessitated the administration of a second dose of pituitrin or ergotol. Among these cases there were conditions predisposing to excessive loss of blood, such as long tedious labor, hydramnios, twins, prolonged anæsthesia, etc. However not one of these cases suffered a blood loss that could be termed a postpartum hæmorrhage.

The comparatively few changes of vulva pads required during the first 24 hours demonstrated that flow of blood had been greatly diminished.

The lochial flow was diminished in quantity, becoming scant about the fifth day, and the change from red to white took place much sooner. At the time of discharge of the patient from the hospital, the lochia was white and scant in 389 cases, serosanguineous in 97, and red in 14 cases.

During the first period after delivery, ranging from 6 to 12 hours, after-pains occurred more frequently than is usual. They occurred even among primiparæ. Subsequently the after-pains were infrequent and mild. Of the 500 cases, 109 had slight after-pain, 28 had moderate, and 18 had severe enough pains to require some thera-

peutic means of relief, 345 did not complain of after-pains at all.

The involution of the uterus progressed with such satisfactory rapidity that a great number of these patients were allowed to get out of bed as early as the fifth day postpartum. The examination on the tenth day postpartum—the day of discharge from the hospital—showed that in 473 cases the uterus was well down in the pelvis, and in only 27 was the fundus above the symphysis.

The morbidity was very low. Only 11 cases had a temperature of 100° F or above for more than one day. These included infected perineorrhaphy cases, 6; acute bronchitis, 1; cystitis, 1; localized phlebitis of the leg, 2; acute salpingitis, 1.

SUMMARY

Five hundred consecutive cases received each 0.5 cubic centimeters of pituitrin at the beginning of the third stage of labor. The uterus was untouched save when the medical attendant sought for the signs indicating that the placenta had left the uterus. The placenta was expelled from the vagina by the voluntary effort of the patient assisted by the medical attendant who would span and support the recti muscles. There was one case of simple retention of the placenta, and three cases of unseparated placenta that required manual removal. The contraction of the uterus was uniformly and perfectly maintained. The loss of blood was surprisingly small. Involution of the uterus progressed more rapidly than usual. The after-pains were, on the whole, less frequent and milder. The general health and well-being of the patients were exceptionally good.

From the above results it is evident that pituitrin, administered at the beginning of the third stage, offers the following advantages:

1. It considerably shortens the third stage of labor.

2. It acts as the most effective preventive of postpartum hæmorrhage, and especially in cases of protracted labor, overdistention of the uterus (hydramnios, twins), intra-uterine manipulation, and where narcotics or anæsthetics are employed.

3. It reduces to a minimum the loss of blood incident to the third stage and to the period immediately following it.

4. It tends to lessen the amount of lochial discharge and shorten its duration.

5. It renders unnecessary all uterine manipulation (gentle massage, kneading, and compression) employed for the purpose of encouraging uterine contractions and guarding against relaxation.

6. It makes Credé's manual expression of the placenta entirely unnecessary.

7. It aids the involution of the uterus.

8. It tends to diminish the after-pains which are due to the accumulation of blood clots in the uterus.

9. Lastly, it diminishes the frequency of retained placenta.

Physicians generally refrain from using pituitrin before the placenta is cut as they fear that pituitrin may cause its retention. They evidently associate the action of pituitrin with that of ergot. But there is this difference between the action of the two drugs: While ergot produces a lasting tetanic contraction of the uterus, pituitrin simply intensifies the normal uterine contractions, which are intermittent. Furthermore, the factors primarily responsible for the retention of the placenta are: (a) spasmodic contraction of the internal os, (b) paralysis or atony of the fundus of the uterus, and (c) disturbance of the retroplacental hæmatoma. One or all of these factors may be created by excessive or improper manipulation of the uterus, especially when an attempt is made to express a placenta that is as yet unseparated. The use of pituitrin renders manipulation of the uterus unnecessary, hence eliminates the principal cause of the retention of the placenta.

The results obtained in the above 500 consecutive cases demonstrate conclusively that pituitrin administered at the beginning of the third stage of labor not only is perfectly safe, but also that it is of distinct benefit to the patient and of considerable advantage to the attending physician, rendering his management of the third stage simpler and safer.

EDITORIALS

SURGERY, GYNECOLOGY AND OBSTETRICS

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JANUARY, 1923

CRANIAL AND INTRACRANIAL TRAUMA

FRACTURE of the skull and the concomitant injury of the brain were favorite subjects of discussion long before the era of modern surgery, and yet there are certain aspects about which differences of opinion and differences of practice persist. The mortality, high as it now is, has been reduced by the elimination, to a large extent, of meningitis as a complication. The immediate and proper management of the scalp wound in compound fracture of the vault and the hygiene of the nasopharynx and the external auditory meatus in basal fractures has reduced measurably the incidence of meningitis. Urotropin is always prescribed with childlike faith but, if it be true that the drug is effective only in an acid medium, it must be inert in the cerebrospinal fluid.

Putting aside the question of infection, there remain two factors which are responsible for the majority of fatal cases; hæmorrhage from the middle meningeal artery and cerebral contusion. The clinical picture of hæmorrhage of the middle meningeal artery has so many distinctive features that one might forecast its recognition and appropriate treatment with but few exceptions. And yet in an analysis by LeCount and Apfelbach[1] of a series of cases in the Cook County Hospital, hæmorrhage from the middle meningeal artery was unrecognized and a cause of death in a not inconsiderable number of instances. These statistics are quoted as a warning to correct the prevailing impression that the symptoms of middle meningeal hæmorrhage always conform to the classical description and are therefore easy of interpretation.

Cerebral contusion and laceration, with or without basal fracture, present the most difficult problem from the standpoint of treatment, and they are the most frequent cause of the fatalities of intracranial trauma. The outstanding feature in the pathology of contusion and laceration is the cerebral œdema, more or less widely diffused according to the violence of the injury, and the concomitant increase in intracranial pressure. Because of the latter, and since the introduction of the operation, subtemporal decompression, resort to this operation, more or less indiscriminately, has become an all too prevailing practice. This statement invites the question, how shall one discriminate?

Let us assume without argument that there is no justification for the immediate resort to decompression, that is, immediately or shortly after the injury. A cerebral trauma, so grave that without intervention death follows within the first 6, 12, 18, or even 24 hours, will not be influenced by a subtemporal decompression. In these cases there may be a grave cerebral anæmia due to the rapid in-

[1] J. Am. M. Ass., 1920, Feb. 21.

crease in intracranial pressure, but the desperate situation is created by a lesion within the medulla itself. It may be an extension of the rapidly diffusing œdema, or an actual intramedullary contusion or hæmorrhage, gross or microscopic. Whatever the pathology, the lesion is within the brain stem and cannot be influenced by a subtemporal decompression. Hence the futility of the operation under these circumstances. May we not assume, too, without argument, that a subtemporal decompression is without justification in cases of so moderate a degree of trauma that the recovery of the patient is at no time in serious doubt. It has been claimed that subtemporal decompression in these cases assures a more prompt recovery from the immediate effects and reduces the incidence of the late effects of intracranial trauma. This is, however, a mere assumption; there is up to the present time no substantial evidence in support of it.

Having eliminated the very grave and the milder cases, there remains an intermediate class, and it is to this class that the operation in question may be performed with propriety. Even in this intermediate class one should discriminate. Operation is appropriate only in selected cases. How shall this selection be made? The decision must be made usually in the second 24 hours after the injury, not before and seldom later and the decision must be based upon evidence of increasing pressure. Too much stress must not be laid upon single observations. We hear too much about the increase of intracranial pressure, as measured by the lumbar puncture manometer, about increase in blood pressure, about papillœdema, as indications for operative intervention. The blood pressure and papillœdema are not infallible signs. The evidence should include a complete survey of the cerebral functions disturbed; stupor or unconsciousness, muscular relaxation, reflex disturbance, Cheyne-Stokes phenomena, and as supplementary evidence only the blood pressure papillœdema, etc. As the cerebral anæmia becomes more intense, the disturbance of cerebral function becomes more pronounced and one soon learns to evaluate the degree of cerebral anæmia in terms of disturbed function. Admittedly, the selection of the time for operation requires an intelligent grasp of the pathology, the physiology, and the clinical evidence of brain trauma, plus the exercise of judgment on the part of the surgeon. But after all, are not these the requisites for success in all fields of surgery? Rules of thumb are poor props on which to build a reputation.

Even in properly selected cases, subtemporal decompression will not tide the patient over the crisis always. As a matter of fact, subtemporal decompression is most effective in those cases in which there is an excess of cerebrospinal fluid in the subarachnoid and subdural space; and the opening of the dura releases the tension by allowing the escape of fluid. *Per contra*, the operation is least effective when there is no free fluid and the herniated brain engages snugly in the dural opening.

CHARLES H. FRAZIER.

GASTRO–INTESTINAL OBSTRUCTIONS

THE experienced surgeon realizes only too well the influence on surgical mortality of operations performed in the presence of obstruction in the gastro-intestinal tract. That radical operations in cases of acute obstruction are seldom permissible has been demonstrated over and over again, and it is generally accepted that some form of drainage operation to relieve this dangerous feature should be performed before the radical operation is undertaken. In these preliminary

operations, it is essential that general anæsthesia of any kind be avoided. Many surgeons have had the unfortunate experience of having patients under a general anæsthetic drown, through the filling of the bronchial tubes with regurgitated intestinal secretions, or die subsequently from pulmonary infections resulting from inhalation of such material. Some form of local anæsthesia, spinal, regional, or infiltrational, is necessary. In the subacute and chronic cases of obstruction the surgeon is confronted with a serious problem which taxes his judgment to the utmost. When there is doubt as to the method of procedure, the operation should be divided into stages, or the two-stage operation should be used if an obstructing intestinal tumor requires removal. In the extremely acute cases it is wise to perform an enterostomy without attempting exploration.

The obstructed stomach, unlike the obstructed intestine, can be emptied with a stomach tube, although it may take several days to remove the quantity of fermenting and putrefying material which sometimes accumulates. While the stomach is being tubed and given a chance to regain its tone, the body fluids can be restored by 6 per cent solutions of glucose, administered by proctoclysis, or 2 and 3 per cent solutions subcutaneously. Following gastro-enterostomy in such cases, gastrojejunal healing may be greatly delayed. Occasionally when reopening of the wound has become necessary a few days after operation for such conditions, the jejunum has been found to separate from the stomach at the site of the gastro-enterostomy like wet paper. It is important in performing a gastro-enterostomy in these cases to make a large opening in the mesocolon and attach its margins firmly to the stomach. In most cases in which there is poor drainage, or in which angulation takes place at the site of a posterior gastro-enterostomy, causing vomiting of bile, the so-called vicious circle, it will be found that the margins of the opening in the transverse mesocolon have become loosened from their attachment to the posterior wall of the stomach and slipped down over the gastro-enterostomy, thus angulating the jejunum.

In cases of colonic obstruction, the distention ulcer of Kocher, usually of the cæcum and ascending colon, is occasionally encountered. The patient may apparently be doing well as the result of a colostomy, when there is sudden perforation of an unsuspected ulcer or ulcers at the head of the colon and the abdominal cavity is flooded with the intestinal contents, with consequent death within a few hours.

In cases of obstruction of the pelvic colon and rectosigmoid, a preliminary colostomy far to the left is advisable, as this makes it possible to open the abdomen in the middle line for a secondary procedure which may be carried out without danger of contamination. The colostomy is of great value not only in relieving the obstruction, but in permitting thorough cleansing of the involved fragment of the colon before the radical operation is undertaken.

In cases of obstruction of the splenic flexure and descending colon a colostomy in the transverse colon gives excellent results. In certain cases the colostomy should be made close to the sigmoid growth, so that after the obstruction is relieved the colostomy and growth may be removed simultaneously through a single incision at the second radical operation. When the radical operation is performed in cases of this type it is sometimes wise to make at the same time a protective cæcostomy after the appendix-stump method advocated by Willy Meyer. WILLIAM J. MAYO.

MASTER SURGEONS OF AMERICA

HUNTER HOLMES McGUIRE

"The greatest thing any living soul can do is to see something clearly and tell it plainly."

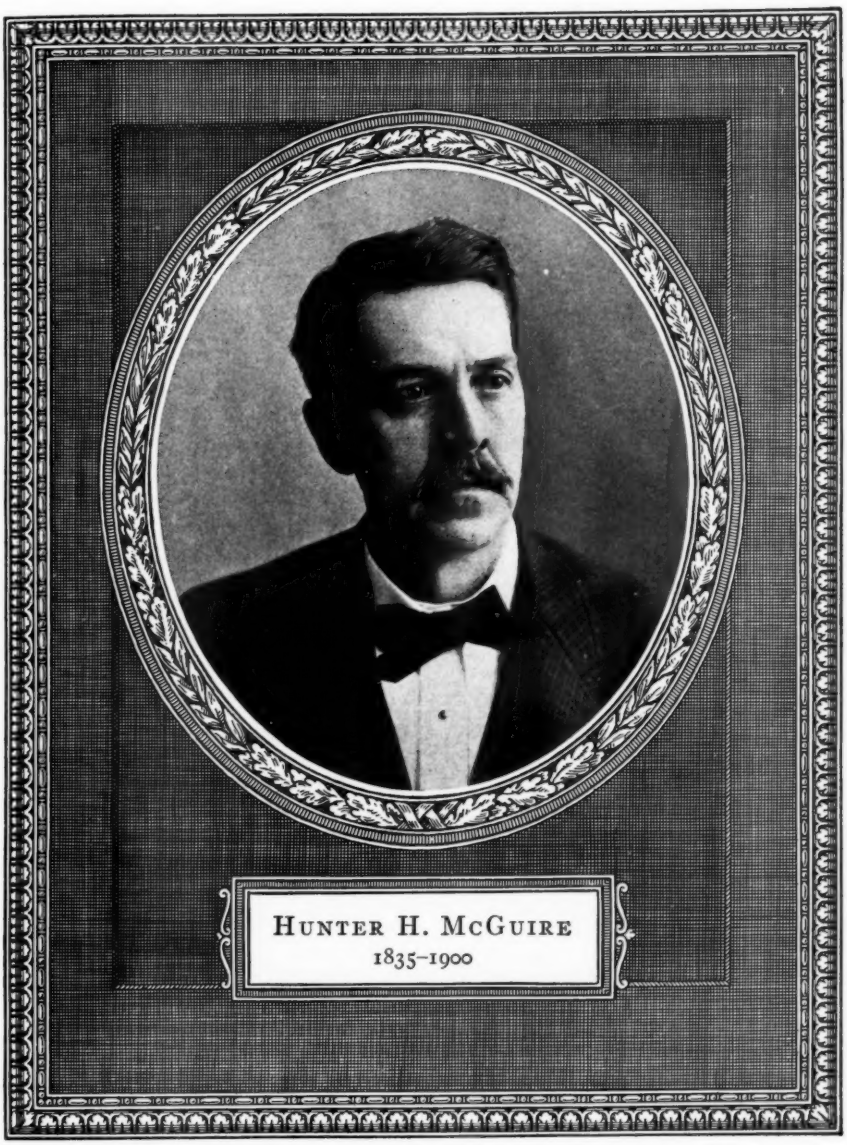
HUNTER HOLMES McGUIRE was born at Winchester, Virginia, October 11, 1835. He was the son of Dr. Hugh Holmes McGuire and Eliza Moss of Fairfax County, Virginia. The family were originally from the County of Fermanagh, in Ireland. His grandfather, Captain Edward McGuire, was a well-known figure in the Continental Army.

Young Hunter received his academic education at the Winchester Academy, where his father before him had been a student. His early medical training was gotten at the Winchester Medical College, a school founded and conducted by his father and a group of physicians. His studies were later completed in the medical schools of Philadelphia.

From 1856 to 1858 he held the Chair of Anatomy in the Winchester Medical College. He then returned to Philadelphia, where he conducted a quiz class with Doctors Pancoast and Luckett. It was about this time that the shadow of John Brown dropped like a black curtain along Mason and Dixon's line, and men on either side no longer saw clearly nor understood one another. It was like "the burden of Egypt"; when the Egyptian was set against the Egyptian, and they fought, every man against his brother, city against city, and kingdom against kingdom. Feeling ran high in the City of Brotherly Love; and, as it has always been and doubtless always will be, the sparks fell first and blazed quickest among the students of the city.

It was now that young McGuire first showed those qualities of leadership that were to carry him to greater and greater heights in later years. A young man comparatively unknown, without special power of oratory or persuasive eloquence, he quickly organized the Southern students, three hundred strong, and led them in a body to Richmond, to finish their studies in the more kindly and sympathetic atmosphere of the Medical College of Virginia. Having located his friends in congenial surroundings he soon went to New Orleans and took up the practice of his profession.

And now came war! It was 1861, and we find young McGuire a private in the ranks of the first volunteer company that marched out of Winchester. He



HUNTER H. MCGUIRE
1835–1900

was soon singled out by Jackson, who was quick to see those qualities that make for executive success, and so in a few months we see him medical director of Jackson's Army, a position which he held until the enactment of that staggering tragedy at Chancellorsville. After the death of his chief, he served as medical director of the Second Army Corps until the close of the war.

To see how well he bore himself in the eyes of that rigid disciplinarian, one need only glance at Jackson's official reports and dispatches, which are filled with a generous measure of praise for his medical director. It was he who inaugurated the freeing of captured Medical Officers, a generous and humane inspiration which was quickly reciprocated by the Federal Army, thus establishing a splendid precedent which soon became a recognized practice. Much has been written and more might be told of his military record, of his intimate association with that master of strategy in his brilliant campaigns in the Valley of Virginia,—of the lightning-like strokes that fell, no man might say when or where. But in the fulness of a life so big, so replete with varied activities, the chronicler must not be tempted to linger too long in one field.

In 1866 he was married to Miss Mary Stuart, daughter of Alexander H. H. Stuart, of Staunton, Virginia. To them were born three sons and six daughters.

He now made Richmond his home and once more entered on the practice of his profession.

In the midst of a busy life he always found time to pause or stop to battle for the right. Notable among such occasions was the fight that was being waged by Captain John Cussons and others against the histories that were being used in the Southern schools. To keep the facts of history straight, when vision twisted and warped by bitterness would have given our children a false impression of what their fathers fought and died for, was a cause he could not resist. Into it he threw himself with all his whole-hearted vigor and force, until the desired aim was accomplished. This achievement alone would have set him apart as a man among men.

But it is not for this that he is best remembered. It is not for the long list of professional honors that were heaped upon him; from president of the Medical Society of Virginia, of which he had been a founder, to president of the Southern Surgical Association, president of the Association of Medical Officers of the Army and Navy of the Confederate States, president of the American Medical Association, and president of the American Surgical Association. It is not for the honorary degrees of doctor of laws conferred upon him by the University of North Carolina and Jefferson College of Philadelphia. It is not as the founder and president of a great Medical School, the University College of Medicine, which sent hosts of young men to all the States in the Union. It is not as founder of St. Luke's Hospital, one of the earliest private hospitals in the South, in which his work still lives and goes on under the skilful management of his gifted eldest

son, Dr. Stuart McGuire, whom he reared and trained to fill his place when the time should come for him to rest from his labors. It is not for any of these notable achievements that men best remember him or most delight to do him honor.

But it is Hunter McGuire the teacher who has left his image deeply graven on all the hearts and minds of men with whom he came in contact. This is the figure that stands out clear-cut, pre-eminent.

But what were the qualities of this tall, gaunt, angular man, without eloquence of speech or charm of voice or manner, that made men listen to his every word, that make them remember words, phrases, sentences, with every inflection of his voice, for nearly half a century? It was not the clear intellect of the man that made this compelling appeal. It was a deep, encompassing love of his fellow man; never expressed, but shown in a thousand ways, that sets him thus apart.

In those days surgeons were evolved, they were never made. They came up from the practice of Medicine by slow degrees, with toil and labor. But the process made well-rounded men, and Dr. McGuire was no exception, for he was first a brilliant physician, and then a distinguished surgeon. He had a quick intuitive grasp that was at times almost uncanny. He doubtless never reckoned in percentages. He seemed not to work deductively nor through the slower process of elimination.

His mind, a veritable treasure trove filled with the riches of experience, seemed able instantly to flash out a duplicate of any clinical picture that might be needed for comparison; just as the finger-print expert might reach down from his files the fatal duplicate of the criminal's thumb print.

Each case was with him a separate thing to be reckoned with individually. But first of all it was a living human being with the love of life in his heart and an inherent right to live. He seemed the husband pondering the problem of the sick wife; the father looking down on the afflicted child; and, at times, with these little crippled ones, the touch of the big red hands was even that of the mother herself. This was the key, the secret of this man's power to chain men and women to him blindly for a lifetime; a deep, far-reaching, practical humanity, that was all the more beautiful for blunt efforts at concealment.

"He saw things clearly and told them plainly."

As has been said, he was not an orator; and yet no man ever got a fuller meaning out of words than he. Abruptly he would say: "And that poor fellow's suffering was frightful." Immediately that word "frightful" took on a new meaning, and one saw the poor fellow suffering the very tortures of the damned.

Who ever heard the history of the first prostatic on whom the first suprapubic cystostomy was done—the operation that sent his name halfway round the world; who ever heard that simple story of the extremity of human suffering and its blessed relief, and ever forgot a single detail of that vivid picture?

Never was he at better advantage than when, as he would sometimes do, he pushed all the operative work aside and had a blanket spread on the amphitheater floor, with a group of little crippled children on it. Hip-joint disease, Pott's disease of the spine, tuberculosis of the joints and bones; how he hammered home the early symptoms and diagnostic signs! How mercilessly he fixed the personal responsibility for failure to recognize them! How many men who read this must instantly visualize that picture!—the little hunch-back, with rigid spine, squatting down to pick up his bunch of keys. Is it not the very acme of teaching that men will so remember?

In his operative work he was practical, dextrous, and ingenious. He was quick to make a decision, and once his decision was made he went through with his plans to the end.

It must be remembered that much of his work, like that of the pioneer, was in untrod fields; much of it was done in pre-aseptic times when the mortality rate alone, even in skilful hands, was enough to stagger any but the most courageous. Unlike many men of his time who faced a new era, he was quick to see the good of the new, to grasp it, and turn it to his uses. He wasted no time in the forlorn fight of the older order in its bitter rear-guard action against the new. Listerism he readily embraced, and we find him an enthusiastic exemplar of its principles. When many men of his age were vigorously assailing the germ theory, he was busily engaged in teaching those very principles and demonstrating them by practical application in the operating room. With rare judgment which seemed almost intuitive he gleaned what was good from the new and winnowed out the chaff. In short, he was among that small group of men who marched on with the times.

It was only a year before his last illness that he had completed and equipped a large new modern hospital to take the place of the old, and to better care for his ever increasing practice.

He was never an idler, but was always engaged in some useful activity, as though time were too precious a thing to squander. His recreations were few. He most loved to be in his summer home, "Westwood," not far from Richmond, in a grove of great oaks, with flowers and birds and growing things about him. It was here, surrounded by his family, that, after a lingering illness of more than a year, on the morning of September 19, 1900, death claimed him.

To his funeral the people flocked to do honor to his memory; men, women, and children, from every walk of life, and old comrades clad in gray. A year later out of the full hearts of a grateful people a monument arose in the Capital Square, close to his beloved Jackson. There he sits, calm, dignified, reserved; just as he sat listening to the tales of suffering of his people—counselling, advising, always helping, giving. Every line of the pose is perfect. The sculptor, indeed, has modelled well. There he sits close by the scenes of his greatest activities:

close to the hospitals and institutions of learning that he founded and fostered; in the shadow of the capitol of the Confederacy; close to Jackson.

What are they thinking of, these two strong men of bronze, as the years go by? What is in their hearts, as the South sends forth its thousands of young men, khaki clad, marching to new music under the flag they fought against? What do they say to one another, far in the night when the lights are low?

Who knows?

W. Lowndes Peple.

CORRESPONDENCE

INTERPOSITION OPERATION FOR UTERINE PROLAPSE

To the Editor: The interposition operation for procidentia uteri is one which I fancy is held in the utmost respect by all gynecologists who have had experience of it. It is a most excellent operation, but it must not be expected to do the impossible. If we look at Figure 5 in Shaw's recent article in SURGERY, GYNECOLOGY AND OBSTETRICS (March, 1922) we can see exactly what it may, and what it certainly may not be expected to do. It may be expected to keep up the bladder permanently, to support the anterior vaginal wall and the body of the uterus, so long as that body is too large to be able to rotate on a transverse diameter in the pelvis in such a manner as to bring the cervix down toward the vulva. But it may not be expected to offer a barrier to the descent of the cervix, once the body has begun to atrophy, or when it is already atrophied. This last point must be obvious to anyone who considers the condition of the uterus, the vagina, and their ligaments prior to operation. The uterosacral ligaments and the lateral ligaments are lengthened until their uterine insertion can be felt at, or a long way outside. the vulva. The vault of the vagina is dragged down to the same position, and its suspending ligaments are either torn or stretched. If, therefore, the repair operation is limited to the shortening of the cervix the interposition of the uterus, and the repair of the perineum, once the uterus lessens in size the floating vaginal vault and cervix, under normal conditions must again descend, and, as Shaw says, the results of the operation will certainly not be brilliant.

It is a good many years now since, in common with many other gynecologists, I pointed out that if a prolapse operation is to succeed it must not merely bring the uterus back into a suitable position but must also, so far as possible, remove every factor which tended to force it or to allow it to travel out of that position. This is only another way of saying that all the associated lesions of the displacement must be set right, so far as possible. If this is not done the neglected lesion will eventually cause so great a strain to be thrown on the repaired structures, that, whereas they might have been quite able to stand a normal strain, they yield under the abnormal one. If this is true then it is obvious that so gross a lesion as the marked lengthening of the uterosacral ligaments must be cured, or else the cervix is still free to descend.

I think that if Shaw will take this point into consideration, and will carry out the routine shortening of these ligaments in all cases in which they require shortening, he will find that the results of interposition will be widely different from those he records. I regard one or other of the following procedures as the most efficient prolapse operations at our disposal at the present time, and I have been carrying them out for a good many years. I am sure there have been some failures, but I have not seen them. In young women in whom it is necessary to make allowance for future pregnancies, I advise curetting, amputation of the cervix where necessary, shortening of the uterosacral ligaments, anterior colporrhaphy, colpoperineorrhaphy, and shortening of the round ligaments (Alexander). In women near or past the menopause, I advise curetting, amputation of the cervix where necessary, shortening of the uterosacral ligaments, interposition, and colpoperineorrhaphy. The technique of the associated operations of cervical amputation, uterosacral shortening, and interposition, is a little difficult when one tries it for the first time, but a very little experience soon shows the best manner in which to adapt the different steps of the operations to one another.

In partial prolapse, where the lengthening of the uterosacral ligaments is but slight, then obviously it is unnecessary to interfere with them, just as it is unnecessary to amputate the cervix when its condition is normal. In complete prolapse on the other hand—at the risk of repetition I must emphasize the point—the performance of interposition alone is an inadvisable and unnecessary method of courting failure.

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Christchurch, New Zealand.

TRANSACTIONS OF SOCIETIES

CHICAGO GYNECOLOGICAL SOCIETY

REGULAR MEETING HELD JUNE 16, 1922, DR. WILLIAM C. DANFORTH, PRESIDING

MYOMATOUS UTERUS

WILLIAM M. THOMPSON: I am showing you this specimen of a myomatous uterus, not because of its size or anything peculiar in its pathology, but because the uterus was rotated from left to right, the right broad ligament was posterior and the left broad ligament was anterior and in contact with the bladder. The specimen was 10 inches long, 10 inches wide, and 7 inches in anteroposterior diameter. The patient was 49, unmarried, had menstruated very profusely for one week previous to the operation. For 6 months menstruation had been profuse, but regular. Her physician had tried for 5 or 6 months to induce her to go to the hospital. Finally worried by the rapid growth and the pain in the lower left quadrant of the abdomen, she was induced to undergo the operation. The rotation was caused by the growth of the myomatous nodules which acted as a lever on the body of the uterus.

The difficulties encountered in the removal of such a tumor are usually found in the proper dissection of the tumor from the bladder. Present-day authors give small space to the removal of difficult uterine tumors. The technique must be varied in accordance with the growth. It is not always possible to dissect out the fibroid beginning with one side and going down on across and up. Very often the problem taxes the ingenuity of the operator because the growth is so impacted and the tumors are found low in the uterine body, as was the case in this specimen.

DERMOID CYST OF THE OVARY CONTAINING A BUCCAL CAVITY WITH PARTIAL DENTITION

DR. ALDO K. GERMANN: Teratomata in the broad sense may be divided into two distinct types: dermoid cysts and solid teratomata. In dermoid cysts the tissues found resemble the adult type and show a tendency to form rudimentary organs. The three embryonal layers are usually represented: ectoderm by skin, hair, sweat and sebaceous glands, teeth, retina, nerve tissue, etc.; endoderm by intestine, bronchi, etc.; mesoderm by cartilage, bone, and muscle. Although in most cases all three layers are found, cysts have been reported which show only one or two of the layers. The most common single layer type is the struma ovarii made up of only thyroid tissue.

Dermoid cysts are more frequently unilocular and are usually of moderate size, although they may rarely reach the size of the patient's head. While they occur more frequently unilaterally, bilateral occurrence is quite common. This latter fact causes the careful surgeon to examine the opposite ovary in every case of dermoid cyst.

Dermoids are usually surrounded by a fibrous wall of varying thickness, while they are usually lined with more or less completely developed cuticular structures: corium, papillæ, epidermis, hair follicles, sebaceous glands, etc. The cyst cavity frequently contains a thick, white, greasy material composed of flattened epithelium, fat, cholesterin crystals, hair, teeth, bone, cartilage, pharyngeal ciliated epithelium, striated muscle, thyroid, nerve fibers and cells. It is generally conceded that the epidermal structures predominate. On the inner wall of the cyst, there is commonly found a projection called the dermoid papilla which has been regarded as the embryonal anlage from which the various structures arise.

Solid teratomata, on the other hand, contain tissues in an early fœtal stage of development, and elaborate organ formation is not seen. Myxomatous connective tissue, sarcoma-like and carcinoma-like stretches are intermingled with innumerable small cysts lined by varying epithelium. Cartilage, bone, undifferentiated striated muscle, neuroglia cells, etc., occur. This type of tumor is more malignant and more frequently metastasizes. The malignancies are usually of a sarcomatous but may be of a carcinomatous nature.

There are numerous theories regarding the origin of teratomatous tumors, the most important of which will be briefly sketched below. It was at one time considered that the presence of a teratomatous, or so-called dermoid, ovarian tumor was positive proof of the unchastity upon the part of the possessor. In other wards, the development of this tumor was impossible in the absence of an impregnated ovum. This theory is obsolete.

MacCallum, in his *Text Book of Pathology* (1919), accepts the theory that teratomata are formed from cells split off from blastomeres. He says: "It is obvious that there is a chance for the development of a mass of tissue of almost any degree of complexity from a blastomere, if we are willing to assume that it may become independent of the others at

some stage in the segmentation. This idea involves the further assumption that this independently growing blastomere may remain attached to the main embryo or become partly or completely surrounded by it in its growth, so as to be finally included in its body. With this explanation there is no difficulty whatsoever in understanding the localization of a teratoma, in the testicle, or in the brain, while with the others which involve fertilization and development of ova, etc., insuperable obstacles are met with in many cases. With this explanation, too, there is no difficulty in comprehending the formation of teratomata of all degrees of complexity down to the simplest cysts, composed of one or two types of tissues, whereas, if they arise from fertilized polar bodies, primary sex cells, etc., we should expect in every case growths more closely simulating complete individuals. There is such abundant material illustrating every stage of attachment, inclusion, and final complete enclosure of one body in the other that no assumption is required and the story is practically complete."

Marchand put forth the theory of fertilization and development of the polar bodies, but to quote MacCallum again: "There is practically no evidence in its favor, and it has been pointed out that there may be multiple teratomatous tumors which could not be explained on this basis, since at most there are but two polar bodies."

J. R. Goodall of Montreal has worked extensively on the problem of the origin of teratomata. He says: "There is little doubt today that ovules, by a system of parthenogenesis, are responsible for the presence of dermoids and teratomata. It is very probable that parthenogenesis sets in soon after ovulation. The altered conditions in the ovaries at that time (variations in blood pressure, in intrafollicular pressure, changes in oxygen supply) furnish the necessary stimulus. There is no adequate scientific explanation for the extragenital cases. Those of the trunk and peritoneal cavity, however, may have the same origin as those of the ovary, ectopic ovarian tissue."

Teratomata are not rare. Almost 10 per cent of ovarian tumors at the Mayo Clinic were found to be teratomata. They occur in patients varying from infancy to old age, but are conceded to be the most common ovarian tumor up to the age of puberty. These tumors usually have a long pedicle which is one of the main factors in producing symptoms.

There may be no symptoms associated with the tumors, as in the case which I am reporting. There is usually no characteristic menstrual or sexual history. Harris, however, reported a case associated with precocious sexual and somatic development. The growth of the tumor was associated with the beginning of puberty at the age of 5 years. The body development was that of a child of 9 years. The tumor was found to be a complex cysto-solid teratoma with definite adenocarcinomatous areas. There was no menstruation and no further precocious growth after the removal of the tumor. Thirty months after the operation there was no discoverable recurrence. The symptoms are chiefly those resulting from torsion and compression.

Photograph of specimen showing interior of the cyst removed from patient of Dr. Germann.

When dermoids are associated with pregnancy, there are two chief conditions which must be considered. In the early months of pregnancy the dangers are most frequently from torsion of the pedicle and infection. During the latter months of pregnancy, torsion, gangrene from pressure, rupture, and suppuration may take place. These tumors may also block the pelvis during labor.

In the diagnosis of these tumors, the history and symptoms sometimes give important data. In palpating the cyst bimanually, we may sometimes get some help from the cystic contents, thus: hair would possibly give a characteristic, palpable sensation; the sebaceous material might give a putty feeling, while bone and teeth might be felt as hard objects. These physical findings, however, appear better on paper than in the examining room. Since these tumors have long pedicles, it is said that they have a tendency to float in front of the uterus. Last, but of very great importance, is the X-ray examination. If teeth or bones are present, the X-ray will make the diagnosis.

The treatment is operation by the abdominal route as soon as the diagnosis is made, especially in early co-existing pregnancy. When pregnancy is well advanced and the tumor is not obstructing the outlet, the operation may be delayed. It is the consensus of opinion now that a normal pregnancy should not be interrupted. Francis B. Dyle, of Brooklyn, and Frank Benton Black, of Philadelphia, each report a case of dermoids complicating pregnancy in which the tumors were removed and the patients were delivered of living babies at term. Morphine was used freely after the operation in both of these cases.

In every dermoid cyst the opposite ovary should always be carefully examined, even if it must be partially sectioned to be sure it contains no pathological areas. Some of these ovaries appear normal on the outside, while a gross section will reveal the presence of a dermoid.

Every dermoid cyst should be removed intact and not tapped before removal. Many of them are infected. Dr. O'Shansky, of New Haven, reported a dermoid from which he isolated typhoid bacilli. The patient had had typhoid fever 2 months previous to the operation. Graves says the contents of these cysts are also corrosive and conducive to peritonitis.

The case which I report is unusual and there are several distinctive features which I would like to bring out.

Case No. 14772. G. H., single, age 26, entered the Presbyterian Hospital, August 3, 1921, complaining of vomiting. Her menses began at 13 years, were regular, every 28 days, lasted for 5 days, and were somewhat profuse the first day or two. There was no dysmenorrhœa. Her last menstrual period was June 19, 1921. The patient began to vomit July 24 and became progressively worse until she entered the hospital August 3. She was admitted to the medical service and put on appropriate treatment. The urine, blood, and gastric examinations were normal. The routine pelvic examination by the internist revealed a mass in the left adnexa. The report of the gynecological service was as follows: cervix definitely softened; uterus soft and enlarged, typical of pregnancy; a rather large, firm mass extending to the left of the uterus; right adnexa normal; small fibroid on the anterior uterine wall. Pre-operative diagnosis: pregnancy, possibly ectopic, or intrauterine pregnancy with subserous fibroid. There was some vaginal bleeding after the examination.

On August 14, 1921, the patient was operated by Dr. N. Sproat Heaney. Mid-line incision. The omentum was adherent to the bladder, anterior wall of the uterus, and the left appendage area. The uterus was the size of a 6 to 8 weeks pregnancy. There was a small subserous fibroid 1 inch in diameter on the anterior uterine wall. The right tube was of practically normal size but showed some inflammatory adhesions. The right ovary was of normal size and appearance but bound down to the pelvic wall by adhesions. The left appendages had lost their identity in a hard rock-like swelling, larger than the fist, lying to the left of the uterus, bound down to the pelvic wall, and partially blocking the inlet. The sigmoid was plastered over this mass. The tumor was ruptured during removal, allowing the escape of a foul-smelling pus, which was immediately taken up by laparotomy sponges. The tumor, though extensively adherent, was removed, leaving the left pelvis raw. The sigmoid and rectum were sutured over the raw areas. The small fibroid was enucleated. The incision was closed, leaving a superficial drain in place.

Owing to the bleeding upon vaginal examination (threatened abortion) and the severity of the operation, the uterus was emptied by dilatation and curettage. Typical placental tissue was removed, but the fœtus was not found.

Operation: Left salpingo-oophorectomy; myomectomy; abortion.

Postoperative results: The wound was infected but healed by secondary union and patient was discharged in good condition.

Gross pathological report. The tumor mass, removed, measured 7.5 centimeters by 6 centimeters by 4 centimeters. It was covered with dense fibroid tissue. Along one edge of the tumor and firmly adherent to it was the thickened, enlarged tube containing a rather thick pus. The tumor was sectioned and found to contain a large cyst filled with gelatinous material. In describing the interior of the cyst, Dr. Frederick B. Moorehead says:

"The interior of the specimen illustrates a fairly well formed mouth with partial dentition; on the left side two well developed bicuspids in perfect occlusion, and on the right side a well formed molar and what corresponds to a poorly formed wisdom tooth. On the floor of the cavity are the distinct and well formed outlines of the tongue, showing the median raphé. The vault in a good representation of the palate, and the sides illustrate splendidly the buccal apertures. It is interesting to note the presence of caries in two of the teeth." Numerous areas were taken for microscopic diagnosis. The accompanying figures are sketches of the tumor.

Microscopic diagnosis. The cavity of the cyst was found to be lined with squamous epithelium. No hair follicles or sebaceous glands were found. The cyst showed definite evidence of infection, as the epithelial as well as subepithelial structures were crowded with leucocytes.

Embryonic, as well as mature, connective tissue was found. Muscle strands and fat cells were also present. The case presents several distinctive features:

1. There were no symptoms relative to the tumor and the diagnosis of a dermoid cyst was not made. The tumor was found in routine pelvic examination.

2. The cyst was infected and associated with a pus tube on the same side.

3. The tumor was bound down with firm adhesions, did not have the usual pedicle, and blocked the pelvic inlet.

4. The question arises as to whether or not the uterus should have been emptied. The vaginal bleeding on examination, together with the severity of the operation, would probably have resulted in an abortion with the possibility of a second operation. The fact that no ovum was found after a careful examination would suggest that it was either overlooked or, which is quite possible, that the ovum had been absorbed. No microscopic changes, however, were seen in the chorionic villi.

5. An X-ray examination would have made the diagnosis, had the condition been suspected.

6. As seen in the microscopic and macroscopic report, the cystic cavity took the form of the oral cavity with the lower and upper jaw bone in which

teeth were set. The cavity was lined with squamous epithelium which, although embryonal in type, was characteristic of the epithelium of the oral cavity.

CLINICAL INVESTIGATION OF VULVOVAGINITIS

DR. IRVING F. STEIN read a paper entitled "A Clinical Investigation of Vulvovaginitis." (Inaugural thesis, see p. 43.)

DISCUSSION

DR. O. T. SCHULTZ (Michael Reese Hospital): It seems to me, Dr. Stein's conclusions are justified by the work that was done. In a condition so important as vulvovaginitis and about which there are still a number of controversial points we need some criterion for diagnosis, some definite method of treatment, and standards upon which conclusions as to cure are to be based. As he said, probably smears well made and properly stained and examined by an expert are as good a method as we can demand and probably more satisfactory than cultures alone. In depending upon smears alone some positive gonococcal cases, especially the more chronic ones, will escape detection; but it is doubtful whether cultural methods will give any more satisfactory results in such cases. On the other hand, the finding of gonococcus-like organisms in the smear may lead to a positive diagnosis in a small percentage of cases in which cultural methods would establish that these organisms are not gonococci; in determining the bacteriological factors in the non-specific cases cultural methods may be of an advantage. Only 50 per cent of the cases which were positive on smear examination yielded positive cultures. This is a rather severe criticism of the cultural method at first sight, but it is hardly a fair criticism. As a matter of fact, a group of the cases which were positive on smear diagnosis and negative by culture would undoubtedly have been positive if the cultural work had been done by the bacteriologist responsible for the rest of the work; during vacation it was necessary to rely upon the aid of one less experienced in this particular kind of work.

Dr. Stein did not go into the bacteriology of his cases in detail. Of the cases which were non-gonorrhœal, he has had several interesting groups, upon which we are still working. There was one group in which the streptococcus was probably to be blamed. We have isolated several varieties of the streptococcus, chiefly of the intestinal group, which others have found to be more or less normal inhabitants of the intestinal canal. These varieties of streptococci are apparently able to produce a non-specific form of vulvovaginitis. We have also isolated several strains of gram-negative organisms which in the smear look like gonococci, but which were not gonococci culturally. We have also obtained several diphtheroids upon which work is still being done.

DR. JOSEPH L. BAER: In regard to this very commendable piece of work, the essayist mentioned an epidemic which I worked up in 1904. I should like to emphasize the distinction between vulvovaginitis in children which appears in dispensary observation and that which we ordinarily speak of as the epidemic institutional variety. I believe practically without exception the epidemic institutional variety will run a maximum percentage of positive gonorrhœal types, whereas, as the essayist so well points out, dispensary material is a very diversified lot.

In this particular epidemic of 18 years ago, there were 19 cases in the hospital, and because of the difficulties with cultural methods at that time, I had to limit my cultural work to a small group, but in each of those cases the result was positive. At that time the transmission of the source of infection was finally determined to be by rectal thermometers and bed pans.

DR. MARK T. GOLDSTINE: With regard to epidemic vulvovaginitis, I doubt whether there is such a thing. Personally, I would not be afraid of gonorrhœal vulvovaginitis being in a ward with other clean children. I think it is a contact infection. If it were epidemic, I think we would have a great many more gonorrhœal infections under other circumstances than we do.

In regard to the treatment of gonorrhœal vulvovaginitis, it has interested me because when I was engaged in general practice I was in the Stock Yards District and saw many of these cases. They were hard cases to treat in those days, and I never felt comfortable about cures. Due to the fact that gonococci may lodge in the vulva and vagina, we should be cautious about pronouncing cures for several weeks, 1 year, or even 2 years. Outside of rape, if the infection is a contact infection and attacks the vulva first, and travels from there inward, I would not be anxious about treating cases of vulvovaginitis by introducing medication into the vagina. I would treat the vulva first thoroughly, and watch the case carefully before I would use treatment intravaginally. If the gonorrhœa has attacked the vagina and cervix, you cannot do much with instillations of silver salts. Endocervicitis is hard to cure if it is not gonorrhœal, and I do not think we can cure gonorrhœal endocervicitis with instillations of medicine into the vagina. I treat these cases hygienically outside and refrain from going into the vagina as long as I have good reason for it. In children under 4 years of age the disease is not very pleasant to treat. If the cases are treated, they should be treated by a physician, not by the mothers particularly, and if treated by nurses, the nurses should be told and shown how to do it thoroughly. Above all things, we should be careful about using intravaginal treatments at first.

DR. ARTHUR H. CURTIS: One suggestion I want to make in regard to determining the kind of organism is that although the majority of cases are gonococcal in origin, after many weeks or months have elapsed it is difficult to find the gonococcus. We have found also that there are at least four gram-negative types of diplococci which are extremely difficult to differentiate from the gonococcus.

DR. STEIN (closing): The idea I hope to portray in my report is that I feel that the gynecologist is the man who is qualified to take up the treatment of vulvovaginitis. As this condition is treated today, patients are shamefully neglected. The men who have taken care of these cases have had no definite idea of the disease as an entity, and they have treated it haphazardly.

In reply to Dr. Goldstine about treating these young children intravaginally, the treatment I have outlined is simple. Mrs. Shinn who gives this treatment finds after the second or third treatment the children will lie on the table quietly; there is no difficulty attending its use. The rubber tubing which is inserted into the vagina is of small size and soft, 3 inches long, and the ointment is introduced into the vagina and allowed to run over the vulva. It cleans up the vulva lesions in a few days, and the discharge disappears in a few days more.

The point Dr. Curtis made is well taken. Many of these cases that we get are not acute cases. They have been treated elsewhere and by the time we see them, the gonococci have disappeared, and that is the reason why the non-specific group is so large.

METABOLIC RATE IN PREGNANCY

DR. EDWARD L. CORNELL read a paper entitled "Metabolic Rate in Pregnancy." (See p. 53.)

DISCUSSION

DR. JOSEPH L. BAER: The work I carried out, to which the essayist refers, was limited to normal cases. We felt fairly well satisfied that the curve we constructed represented an average scale for normal pregnancy and the puerperium. In my dead fœtus case, in the thirty-sixth week the readings were +10 before the delivery with the dead fœtus *in utero* and +8 after delivery. It is well known among workers in metabolism that a leeway of 10 per cent must be allowed for personal equation and technical difficulties, so that I feel justified in looking on that woman as having an approximately normal non-pregnant rate. The dead fœtus case to which the essayist referred showed marked variations; +35 with the dead fœtus *in utero* and +8 after delivery. That may seem a discrepancy, but I am inclined to cling to the value of the test in the presence of a dead fœtus. The essayist pointed out in his own series that he has a very definite increase which reaches the maximum at full term. He then emphasized the fact that because of puerperal activities and autolysis of the uterus, the increase is slower in returning to normal in his series than in the series I have reported. If that is true, we must accept the presence of the living fœtus at term as a cause of the considerable increase which both of us found. In my next case of dead fœtus pregnancy I hope to confirm my opinion as to the value of the test.

DR. CHARLES B. REED: In a paper devoted entirely to metabolic rate in pregnancy, it may seem a little superfluous to call attention to one item that has no bearing on the metabolism particularly, and that is the operative feature of the report. I was impressed with this point while the doctor was reading his paper, and while I do not know whether this is his regular experience or not, yet in his 84 cases he had 18 per cent forceps, 8 per cent versions, 6 per cent cæsarean sections, and one craniotomy, which makes 33 per cent pathology in his practice, which is certainly unusual. This is not counting breech cases which we refer to ordinarily as normal cases, nor does it include inductions of labor which were probably done for good reasons, though the technique was not given nor the time at which the induction was undertaken. I am curious to have Dr. Cornell explain if this unusually large pathology was customary with him or whether it happened only in this series of cases.

DR. CORNELL (closing): In trying to do this work, I will say it covered a period of more than a year, and we were only able to complete 84 cases in that time. I do not know how many deliveries I had aside from these. The cases that were completed were included in this pathological group. The women were exceedingly fearful of the test. It is a new proposition and I think Dr. Baer will bear me out when I say that it is very difficult to complete cases. One may get one reading on them, but if a second reading is attempted the patient may go into hysteria or be so nervous that the reading is unreliable. Thus in the entire year and two months we were able to complete only 84 cases. We had well over 200 cases started, so that the pathology in these 84 cases shows up markedly if you take them alone. In the 200 cases or more we tried to complete, we only found one case in which there was a fœtal death. Dr. Baer and I got diametrically opposite results. That does not prove positively that death of the fœtus *in utero* will not have the same change in the metabolic rate. In my cases the reading was taken four times because of this high rate. The work was done by the same technician throughout, except for the last 25 cases when we made a change in the technician. I do not think there was a mistake made in that particular case.

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

X-RAY DOSAGE IN TREATMENT AND RADIOGRAPHY. By Wm. D. Witherbee, M.D., and John Remer, M.D. New York: The Macmillan Company, 1922.

ENDOCRINE GLANDS AND THE SYMPATHETIC SYSTEM. By P. Lereboullet, P. Harvier, H. Carrion, and A. G. Guillaume. Translated by F. Raoul Mason, M.D., with the collaboration of Daniel R. Ayres, A.B., M.D. Philadelphia and London: J. B. Lippincott Company, 1922.

DISEASES OF THE THYROID GLAND. By Arthur E. Hertzler, M.D., F.A.C.S. With a chapter on "Hospital Management of Goiter Patients" by Victor E. Chesky, A.B., M.D. St. Louis: C. V. Mosby Company, 1922.

A TEXTBOOK OF GYNECOLOGY. By James Young, D.S.O., M.D., F.R.C.S. New York: The Macmillan Company, 1922.

DER GEBURTSHILFLICHE PHANTOMKURS. By Dr. med. Wilhelm Liepmann. Berlin: Urban & Schwarzenburg, 1922.

LE RADIUM EN GYNÉCOLOGIE. By A. Siredey and Jean Gagey. Paris: L'Expansion Scientifique Française, 1922.

A SYNOPSIS OF SURGERY. 6th ed. By Ernest W. Hey Groves, M.D., B.Sc. (Lond.), F.R.C.S. (Eng.). New York: William Wood & Co., 1922.

MORTALITY STATISTICS, 1920. Twenty-first Annual Report. Department of Commerce, Bureau of the Census. W. M. Steuart, Director. Washington: Government Printing Office, 1922.

OTO-RHINO-LARYNGOLOGY; FOR STUDENTS AND PRACTITIONERS. 2d Eng. ed. By Georges Laurens, M.D., with a foreword contributed by Sir J. Dundas-Grant, M.A., M.D., F.R.C.S. Authorized English translation of the fourth revised French edition by H. Clayton Fox, F.R.C.S. New York: William Wood & Co., 1922.

JAHRESBERICHT UEBER DIE GESAMTE CHIRURGIE UND IHRE GRENZGEBIETE. Edited by Generalarzt Professor Dr. Carl Franz. Berlin: Julius Springer, 1922.

A PRACTICAL MEDICAL DICTIONARY. 7th revised ed. By Thomas Lathrop Stedman, A.M., M.D. New York: William Wood & Co., 1922.

CLINICAL AND OPERATIVE GYNÆCOLOGY. By J. M. Munro Kerr. London and New York: Oxford University Press, 1922.

INDEX-CATALOGUE OF THE LIBRARY OF THE SURGEON GENERAL'S OFFICE. United States Army. Authors and Subjects. Third Series. Vol. III—Blood–Coffart. Washington: Government Printing Office, 1922.

DISEASES OF WOMEN. By Harry Sturgeon Crossen, M.D., F.A.C.S. 5th ed., rev. St. Louis: C. V. Mosby Company, 1922.

A TEXTBOOK ON MINOR SURGERY. By John C. Vaughan, M.D., and Athel Campbell Burnham, M.D. Philadelphia and New York: Lea & Febiger, 1922.

PROPÉDEUTIQUE ET TECHNIQUE UROLOGIQUES. By G. Wiener. Paris: Masson et Cie, 1922.

BRONCHOSCOPY AND ESOPHAGOSCOPY; A MANUAL OF PERORAL ENDOSCOPY AND LARYNGEAL SURGERY. By Chevalier Jackson, M.D., F.A.C.S. Philadelphia and London: W. B. Saunders Company, 1922.

THE PROCESS OF DIAGNOSIS, INCLUDING THE METHOD OF HISTORY-TAKING, AND PHYSICAL EXAMINATION OF SURGICAL CASES. By E. Stanley Ryerson, M.D., C.M., F.A.C.S. Toronto: University of Toronto Press, 1922.

SELECTED WORKS OF THOMAS SYDENHAM, M.D., WITH A SHORT BIOGRAPHY AND EXPLANATORY NOTES. By John D. Comrie, M.A., B.Sc., M.D., F.R.C.P. (Edin.). New York: William Wood & Co., 1922.

LATERAL CURVATURE OF THE SPINE AND ROUND SHOULDERS. 4th ed., rev. By Robert W. Lovett, M.D., Sc.D. Philadelphia: P. Blakiston's Son & Co., 1922.

THE TREATMENT OF FRACTURES, WITH NOTES UPON A FEW COMMON DISLOCATIONS. 9th ed., rev. By Charles Locke Scudder, M.D. Philadelphia and London: W. B. Saunders Company, 1922.

DE ARTE PHISICALI ET DE CIRURGIA OF MASTER JOHN ARDERNE, SURGEON OF NEWARK, DATED 1412. Translated by Sir D'Arcy Power, K.B.E., M.B. (Oxon.), F.R.C.S. New York: William Wood & Co., 1922.

DUODECIM. KIRJOITUKSIA LÄÄKETIETEEN JA LÄÄKÄRINTOIMINNAN ALOILTA. By Yrjö Kajava, Matti Wallenius, Y. E. Airila, E. E. Anttinen, Gösta Becker, J. A. Murto, S. E. Wichmann. Helsingissä: Duodecim-Seura 1921.

SULL' EPILESSIA POSTTRAUMATICA. By Dott. Prof. Carlo Gamberini. Bologna: L. Capelli, 1921.

CHLOROFORM ANÆSTHESIA. By A. Goodman Levy, M.D., M.R.C.P. With a foreword by Arthur E. Cushny, M.D., LL.D., F.R.S. New York: Wm. Wood & Co., 1922.

BRAIN ABSCESS—ITS SURGICAL PATHOLOGY AND OPERATIVE TECHNIC. By Wells P. Eagleton, M.D. New York: The Macmillan Co., 1922.

A TEXTBOOK OF HUMAN PHYSIOLOGY, INCLUDING A SECTION ON PHYSIOLOGIC APPARATUS. 7th ed., rev. By Albert P. Brubaker, A.M., M.D., LL.D. Philadelphia: P. Blakiston's Son & Co., 1922.

ACUTE CASES IN MORAL MEDICINE. By the Reverend Edward F. Burke, M.A., Ph.D. New York: The Macmillan Company, 1922.

POLARIS, THE STORY OF AN ESKIMO DOG. By Ernest Harold Baynes. New York: The Macmillan Company, 1922.

ARTIFICIAL LIMBS AND AMPUTATION STUMPS. By E. Muirhead Little, F.R.C.S. (Eng.). Philadelphia: P. Blakiston's Son & Co., 1922.

THE ART OF ANÆSTHESIA. 3d ed., rev. By Paluel J. Flagg, M.D. Philadelphia and London: J. B. Lippincott Company, 1922.

TRAITÉ DES FRACTURES DES MEMBRES. Dr. Henri Judet. Paris: L'Expansion Scientifique Française, 1922.

MEDICAL RECORD VISITING LIST OR PHYSICIANS' DIARY New York: William Wood & Co., 1922.

AMERICAN COLLEGE OF SURGEONS

REPORT OF THE HOSPITAL CONFERENCE HELD AT THE CLINICAL CONGRESS OF THE AMERICAN COLLEGE OF SURGEONS OCTOBER 23, 1922, BOSTON

MORNING SESSION—THE PRESIDENT, JOHN B. DEAVER, M.D., PRESIDING

REPORT OF THE STANDARDIZATION ACTIVITIES OF THE COLLEGE IN 1922

BY FRANKLIN H. MARTIN, M.D., CHICAGO
Director-General, American College of Surgeons

IN presenting the fifth annual report of the American College of Surgeons, covering the survey of the civilian general hospitals of the United States and Canada, I have great pleasure in announcing substantial progress in the survey and continued enthusiasm in the work on the part of the profession of medicine, of hospital executives, and of the people.

This stupendous task, the responsibility of which at the beginning was assumed with reluctance by the American College of Surgeons, involving as it did not only the formulation of a practicable minimum standard, but also a continental survey of hospitals to ascertain how many of them already conformed to or were willing to bring themselves to conform to that standard, has now progressed so far beyond the experimental stage that the undertaking has not only been justified, but the responsibility for the continuance of the work for the betterment of hospitals is definitely fixed upon the American College of Surgeons.

The suggestion of a minimum standard was the most important of the initial tasks of the College. Briefly, it included the following fundamental requirements: (1) That the hospital staff be organized and comprised of honest and efficient legalized practitioners of medicine; (*a*) that the staff adopt definite rules for the guidance of its work; (*b*) that the staff meet at least once a month to review the work done by its members in the hospital during the previous month; (2) that accurate and complete case records be written for all patients and filed in the hospital; (3) that clinical laboratory facilities be available for the study, diagnosis, and treatment of patients.

This survey has been conducted through personal visits to the hospitals of the continent by trained medical men who have been specially drilled for this important work. The actual survey was begun in 1918, after much preliminary organization work. The 678 hospitals of 100 or more beds in the United States and Canada were the first to be surveyed, and the reports of 1918, 1919, 1920, and 1921 were exclusively concerned with the 100-bed hospitals. The surveys during 1921 and 1922 included also the 50-bed hospitals.

Therefore, the report that is presented herewith and which covers the 1922 survey, includes both the usual annual report on the hospitals of 100 or more beds and the first annual report on the hospitals having from 50 to 100 beds.

A summary of the results of the reports for the five years is as follows:

In 1918, of the institutions having 100 or more beds, 89 were found to meet the standard; in 1919, 198 fulfilled the requirements; in 1920, 407, or 57 per cent, met the standard; in 1921 the number of approved hospitals grew to 579, or 76 per cent; and this year 677, or 83 per cent, of the 812 hundred-bed general hospitals are on the approved list.

Of the 811 general hospitals having a capacity of between 50 and 100 beds, 335, or 41 per cent, are approved, an excellent showing in view of the fact that previous lists published by the College have not included these smaller institutions.

Grouping together the 1623 general hospitals having 50 or more beds, there are 1012, or 62 per cent meeting the requirements of the standard.

In closing, I wish to state that the American College of Surgeons realizes, inasmuch as it assumed the responsibility of suggesting a standard and surveying the hospitals of the North American Continent, that it is definitely obligated to continue the work until all hospitals of the

Western Continent have been given an opportunity to conform with its ideals. This we can do effectively if we continue to have the hearty co-operation of the medical, nursing, and hospital professions, and the public.

Finally, I wish to acknowledge publicly for the first time the enormous aid the College has received for the last four years from the Carnegie Corporation in financing the important program of hospital standardization. Mr. Henry S. Pritchett, the president of the Corporation (who up to the present has modestly requested that we make no public mention of their aid), has now, at my urgent request, allowed me to make this acknowledgment. The program could not have been so rapidly and efficiently carried out without the Corporation's generous yearly gift.

The program of hospital standardization which has become an epoch-making movement in the progress of medical practice, cannot be properly mentioned without giving credit to one or more pioneers who have devoted much enthusiasm and labor to the task. Foremost among these should be mentioned our former director, now Chancellor John G. Bowman of Pittsburgh University, Reverend C. B. Moulinier, S.J., president of the Catholic Hospital Association, and Dr. Malcolm T. MacEachern, director-general of the Victorian Order of Nurses for Canada and president-elect of the American Hospital Association.

THE DOCTOR AND THE HOSPITAL

By FREDERIC A. WASHBURN, M.D., Boston
Director, Massachusetts General Hospital and Massachusetts Charitable Eye and Ear Infirmary

THIS subject may be divided into two parts: (1) the hospital's obligation to the doctor, and (2) the doctor's obligation to the hospital.

1. The hospital's obligation to the doctor includes its obligations (*a*) to its staff, (*b*) to practitioners in general, (*c*) to physicians who send in patients, and (*d*) to medical students and internes.

a. The hospital should treat its staff with courtesy and consideration—it should grant their legitimate requests as far as practicable. It should make them feel that they are the strong right arm of the administration. By proper organization of an executive committee the staff should be made responsible to the trustees for recommendations of professional policies and staff nominations.

b. The hospital and its staff should share with practitioners in general the advantages which accrue to the fortunate individuals who are on the staff. The hospital may place at the service of local physicians the resources of its X-ray, metabolism, cardiological, chemical, and pathological laboratories in so far as it can do so without interfering with its own work.

The hospital may also give courses on certain days a week which may be attended by practitioners of the neighborhood. Here in Boston such courses have been very successful and much appreciated. They have been chiefly a comparison of clinical and pathological findings with a demonstration of pathological material. Leaders in this work have been Drs. William H. Smith, Oscar Richardson, and Richard C. Cabot.

The general practitioner always has patients with obscure maladies for whom he needs consultation and advice. He wants laboratory and X-ray examinations and, perhaps, the opinion of several specialists. For the rich, these things are provided by admission to private wards and hospitals and in the offices and laboratories of specialists. The poor have the wards and out-patient departments of our general hospitals.

The Massachusetts General Hospital has tried to provide a clinic of consultation for people of small means. Twice a week in the afternoon this clinic is held. Representatives of all professional departments are present. A small fee is charged. The money goes to the doctors after the hospital has been reimbursed for its extra expense for this clinic. Patients are admitted only upon recommendation of a physician. A report of findings is sent him at the conclusion of the examinations. It may be necessary for the patient to come a number of times but no second charge is made. Small laboratory fees are necessary. The patient is referred back to the physician. No treatment is given. The hospital has received repeated assurances from physicians using this clinic that it has been of great help to them in their treatment of patients of small means. The physicians upon the staff have given freely of their services to this clinic. The recompense is meagre but they have felt that they owed this service to their fellow practitioners less fortunate than they in hospital affiliations.

Service to the physician on a broader scale may be exemplified by the case records published by

the Massachusetts General Hospital and edited by Drs. Richard C. Cabot and Hugh Cabot. This publication is sent throughout the civilized world and is of benefit not only to physicians who have access to hospitals, but to many an isolated practitioner in the remote wilderness.

c. How can the hospital help the physicians who send patients to it? The administration must see to it that all inquiries and applications are treated with courtesy. The admitting officer must try to put himself in the place of the harassed doctor at the other end of the telephone. He cannot grant all requests, but he can and must show the hospital's desire to co-operate.

After the patient is admitted, there are many courtesies that the hospital can show the physician who referred the patient. The physician should be notified by telephone of the time of operation. If the patient dies and an autopsy has been granted, the physician should be notified when it will take place.

Upon discharge of the patient, a letter may be written to the doctor giving a brief summary of the case, discharge diagnosis and, perhaps, suggestions for future treatment.

When a physician has referred a patient to the out-patient department a letter should be sent to him stating the diagnosis, and if he is sufficiently interested to make further inquiry, an abstract of record or other information should be sent him without charge. All this involves considerable expense and much work but it is an obligation to the physicians sending patients to the hospital. The institution is amply repaid by the kindly feeling thus gained for it.

d. The obligation of the hospital to its internes and medical students includes their education and training. This is so essential a part of a hospital's duty that I need only name it. The hospital must be sure that its internes receive at least a fair equivalent for the time and labor they give. Careful instruction should be given them and every effort made to see that they get the most possible from their service. The hospital will be repaid by the improved character of house officers and by the possession of a fine loyal alumni.

There will be found few today to question the value of teaching to a hospital. It means keen, alert work in diagnosis and treatment. Fortunate is the hospital which has it.

We must see to it that students receive under proper restrictions every facility to acquire knowledge. It is best to make them as far as possible a part of the machine. This is the hospital's obligation to the medical student—the doctor of the future.

2. The second phase of this subject deals with the duty of the doctor to the hospital. By the very nature of his work the physician is an individualist. He works by himself or with a few others. He does not rub shoulders with the masses of men as does the business man. He is the autocrat of the sick room and if a surgeon, he is commander of the operating team. Hence, to work in the organization with many others is difficult for him and team work of the hospital staff is necessary if results are to be obtained.

The successful doctor meets with something like worship from his patients, especially the women and perhaps from his house officers, medical students, and nurses. Under these conditions we sometimes find a surgeon loses his sense of proportion. If he has not a well developed sense of humor he may even take for fact the estimate of him made by these youthful and exuberant partisans. Such a fault brings its own retribution. No one suffers like the vain man. He continually sees slights of his own importance and is always in trouble because of them.

Physicians do not take kindly to discipline. This is because they are individualists. I have known members of the staff to defy authority and state publicly that they would do certain things in spite of the well considered regulations laid down by the executive committee of the staff, trustees, or the director. Such action, of course, can only result in the confusion and humiliation of the perpetrator.

Speaking roughly or rudely to nurses has in the past been a habit with some men, particularly surgeons in the stress of an operation. If a man appreciated how it reacts against his own reputation we should soon hear no more of it.

I have known members of the staff to speak of the administration of the hospital in a disrespectful manner before house officers, nurses, or students. This cannot be ignored, for from it grows insubordination and contempt of authority.

With all their faults I wish to record my belief that among the physicians of a community you will find the highest ideals, the most generous motives, and the kindest and fairest treatment of their fellowmen of any group, bar none. In the two hospitals of which I have the good fortune to be director, I have met with the most cordial co-operation from the staffs. The team work has been good. The faults which I mention have been met only occasionally.

The physician appointed upon a hospital staff has an obligation to give adequate time and the best service that is in him to the hospital. He draws good from his service only in proportion to

the work he puts into it. A hospital service should mean to a man the opportunity to perfect himself in his profession. If he is a surgeon, he becomes manually expert and improves his surgical judgment. If he is a physician, he sees many more patients at the hospital than he would outside and thus his clinical experience broadens. He comes into contact with other keen minds, and slovenly work is not likely to be tolerated. Service to his fellowman is expected of every physician worthy of the name. The profession is not yet seriously tainted with commercialism. The member of a hospital staff has an opportunity to do much good for humanity. This may be in the actual care of patients, laboratory or research work, and the wise counsel or loyal support of those who are trying to make the hospital a success. Members of a hospital staff who are using their position simply for their own financial gain, or to increase their prestige, are of no use to the institution and should be driven from its sheltering arms.

The present hospitals of the country are in a transition period of staff organization. We have always known that between members of the staff of equal ability a man's value to the hospital is determined by the time, work, and thought which he gives to the hospital. As the complexity of methods of diagnosis have increased and as the difficulty of keeping in touch with others' progress increases,—not to speak of making progress for oneself—it has become more and more difficult for the busy practitioner to be on the hospital staff and give the hospital the sort of service required today. From this fact has developed the full-time or paid part-time hospital physician and surgeon. This is a development in the right direction because it gives to the hospital, time, work, and thought and continuity of planning and effort which the busy practitioner can never give it. On the other hand, I wish to record my firm belief that the hospital will always need on its staff for the direct care of its patients, men who earn their living in the practice of medicine and surgery; but only such men will be needed by the hospital as are willing to make a very definite monetary sacrifice so that they may give it an abundance of time. Such a man should take his reward in his increased prestige, the fact that this connection makes him a better physician or surgeon, and in the satisfaction of forwarding the interests of the leading factor for good in our modern civilization —the great hospital of the community. The legitimate line of progress in the future would appear to be that all important professional services will be headed by men paid by the hospital for a large part of their time; that under them will be a group of paid men whose time is devoted to considerable extent in teaching and research; but that working with these men and with their rights zealously guarded by the hospital will be the unpaid practitioner who is willing to devote considerable time to the hospital work.

It is an unfortunate fact that there are physicians in considerable numbers who have never received the requisite training, but who are trying to do surgery. To many of our people a hospital is a hospital and any doctor is a surgeon. A way must be found to protect these people. There should be some recognized mark of the competent surgeon and the trustees of all hospitals could then forbid others to operate in their institutions. The private commercial hospital would probably require state regulation.

A hospital must have autopsies if it is to check up the cause of its failures. The family physician can help the hospital there more than anyone else, and in aiding the hospital he adds to his own information.

It sometimes happens that the wrong diagnosis is made or the wrong treatment undertaken at the hospital. The hospital would be helped if the physician would send the patient back or write a letter calling attention to the error as it becomes clear.

In general, we may fairly say that if a hospital is doing its full duty, there will be no difficulty about its receiving the loyal support of the physicians of the community.

Without a good professional staff composed of able, unselfish men, a good hospital is impossible. Without a good hospital, correct medical teaching, progress in medical science, and good care of the sick cannot be had.

We should, then, support the work of the American College of Surgeons which is making a notable contribution toward better surgeons, better staffs, and better hospitals.

THE MINIMUM STANDARD AND ITS APPLICATION TO HOSPITALS

By FREDERICK W. SLOBE, M.D., Chicago
Hospital Standardization Department, American College of Surgeons

DURING the past decade an increasing attempt toward standardization in all fields of human endeavor has been apparent. At first, in certain respects, standardization in medical and hospital activities did not keep pace with its development in other lines. The American College of Surgeons, in its hospital standardization campaign, endeavored to correct this shortcoming. The application of the minimum standard to hospitals, in essence, means the closest correlation of all medical and hospital efforts, and the highest degree of mutual cooperation between each individual associated directly or indirectly with hospitals.

Personal contact furnishes the best index to the application of this standard. Our hospital surveyors, during personal visits to 1600 of the general hospitals in the United States and Canada, have had certain observations impressed upon them so repeatedly that a brief enumeration of these impressions seems warranted.

The staff situation involves so many angles that it is difficult to approach it in so short a space of time. There is no standard type of staff organization applicable to all hospitals. Local variations demand varied types of organization, hence it is for each hospital to decide which type best meets its individual needs. There should be, however, a definite organization, including the formation of sufficient committees to cover the various activities of the hospital, in order that responsibility for these activities be accurately centralized. In this connection, the greatest difficulty exists in the small hospital in the small community, where the entire medical personnel of the community use the hospital. In such instances, it may be wise in the beginning to include on the hospital staff all the ethical practitioners in the community, all of them being expected to attend the staff meetings and to co-operate with the hospital in its efforts to improve. Later, various modifications and improvements in the staff organization may be instituted. A too radical or partisan arrangement of the staff in the beginning may definitely retard the subsequent development of the organization.

Another difficulty exists in hospitals which have a large list of so-called "courtesy" staff members in addition to their "regular" staff. These physicians, who utilize the hospital only occasionally, are often less interested in its progress. Even though they use the hospital at infrequen intervals, they should be expected to live up to al the obligations which the hospital expects of its regular staff. The "courtesy" staff members should be informed at frequent intervals concerning the requirements of the hospital, that they are a part of the hospital so long as they send any of their patients there, and that they are expected to attend the staff meetings.

The analysis of hospital results is one of the chief objectives of the standardization program. Much confusion still exists concerning methods in which this should be brought about; naturally, the same method may not be applicable in all hospitals. The College features the regular monthly staff conference because it is the means by which the analysis is best undertaken in the vast majority of hospitals. It is indispensable in nearly all institutions; in only a small percentage can it be considered impractical, notably hospitals with a staff of only one or two physicians where a formal conference is, of course, out of the question. Whether departmental conferences or combined meetings are held is immaterial so long as the various activities of the hospital are covered.

Teaching hospitals closely affiliated with medical schools and certain group clinics connected with hospitals may undertake thorough analysis of their work; the former by a presentation of patients before students and the latter by a close association of the physicians. Even in such institutions, however, there is no question but that there are many occurrences of great clinical importance which lose much of their educational value by failure of being brought to the attention of the entire staff. The group clinic, therefore, should have a regular résumé of its results brought before its staff. The hospital of only two or three physicians should conduct a similar, though more informal review, and the teaching hospital may well bear in mind the added impetus which an analysis of this kind may bring about.

It is the feeling of the College that a large part of the monthly staff meeting should be devoted to an analysis of the casualties including the deaths, infections, complications, unimproved cases and in fact, anything closely related to the clinical work in the hospital. The discussion is impersonal, being a study of certain results and the relationship of those results to the hospital. An

attempt at humiliation should not be countenanced; a clear, straightforward, educational discussion, however, will not invoke antagonism. Our failures are the greatest assets in the light of our experience if we only face them squarely.

Hospitals with a large list of "courtesy" staff members have difficulty in deciding whom they should expect to attend the meetings. Many hospitals solve the problem by inviting all to attend but *requiring* the attendance of those who have had patients in the hospital during the preceding month. Some physicians with multiple staff appointments object to the staff meetings, stating that too many of their evenings are thus occupied. It is uncommon to find many physicians who are extremely active in more than two or three hospitals and they should be willing to devote two or three evenings a month to their hospital affiliations. If they are connected with many other hospitals, it is usually in a consulting or relatively inactive capacity which would not require regular attendance.

Relative to case records the hospital is the logical repository for the medical history of a community. Physicians' office records often are so meagre and varied that they cannot be depended upon to supply complete information in time of need.

If hospitals have deficient records in spite of a sufficient number of internes, it is due to the fact that the internes are not performing their duties because of lack of supervision on the part of the administrative and professional staffs. The available number of internes is insufficient to supply the demand, hence, record clerks or historians are needed. Some hospitals which have only a part-time historian fail to realize the many functions of a case record department. In the future every hospital of twenty-five or more beds will have at least one full-time record clerk. At present many hospitals find it satisfactory to utilize part of the historian's time in other activities of the hospital.

In the cities a not uncommon difficulty exists in certain hospitals used almost exclusively by physicians who have studied their patients thoroughly in their offices, have had a large volume of diagnostic work performed outside, and bring the patients to the hospital for operation or treatment only, failing to realize the necessity for furnishing the hospital with the records. Such physicians often keep good office records; if so, the hospital should be sent copies; if not, the physician should co-operate with the efforts of the hospital to secure accurate records for its files.

A very common deficiency in hospitals which have recently instituted record systems is a very brief, stereotyped form of case record which seems to fit about 80 per cent of the patients and gives one very little knowledge of the diagnosis. In most instances this is due to lack of staff supervision of the internes, record clerks, and of the records themselves. Operation records are notably weak in a complete description of the exploratory findings and operative technique. In order to insure accuracy they should be dictated or recorded during or immediately after all operations. Each physician is responsible for the record of his patient even though most of the labor may be relegated to an interne or record clerk. If so, the physician should take sufficient time to insure the accuracy of the records. This will save him subsequent embarrassment, as well as insuring the patient and the hospital accurate reports for future reference.

Sufficient space for the record room, conveniently located, must be available; in order to be used frequently and accurately, records must be immediately accessible. This means good filing cabinets and cross indices for name and disease. Whether filed in groups by disease, or filed numerically is immaterial so long as the record can be obtained immediately. There is no standard disease nomenclature which is used by all hospitals. At the present time, therefore, the *International Classification of Diseases*, published by the Bureau of Census, Department of Commerce, Washington, D.C., and other well known disease nomenclatures are being utilized.

Another great omission in hospitals consists in failing to make adequate use of the records. After expending a great amount of time and money on the records, it is a great economic as well as an educational loss if records are not utilized to the fullest extent. By using the records, I refer chiefly to the analysis of hospital results mentioned in connection with the staff meeting and with the work of the record and program committees. After a hospital has a complete record department, material of great statistical value will become available to an increasing extent each year. This will be particularly true when hospitals adopt more uniform nomenclatures so that their statistics are uniformly comparable.

The question of laboratory service involves varied interpretations according to the size, type, and location of the hospital. Each hospital should have a laboratory of its own for the performance of the usual routine examinations, such as various chemical, microscopic, and bacteriological analyses. Naturally, the more technical tests may have to be performed outside as the available number

of serologists and pathologists is not sufficient to supply each hospital. This applies especially to the hospitals in the small communities, in which the service is considered satisfactory if an adequate number of specimens is sent to competent laboratories.

Technicians should have adequate supervision either by a part-time pathologist who visits the hospital at regular intervals, or by some staff member, fully versed in laboratory technique and interpretations. Some hospitals with the most complete laboratory equipment perform fewer tests per patient than hospitals with relatively meagre equipment. Laboratory service, therefore, is not always proportionate to the laboratory facilities themselves. This discrepancy is often due to the system of laboratory charges and affects particularly private patients where a separate charge is made for each test performed. There is often a hesitancy on the part of the physicians to prescribe certain laboratory tests if they realize that a separate charge will be made each time. This can be obviated first by the adoption of a flat-rate fee, to include the usual laboratory examination, or no fee at all may be charged if the cost of the laboratory is determined and subdivided by adding a certain charge to each room or rate per day. The hospital then can insist upon a certain laboratory routine without adding each item to the patient's bill. Tissue examinations must be included in this, in order that the hospital may have every specimen sent to the laboratory. This should be as rigid a part of the operating room technique as the sterilization of instruments. As many specimens as possible should be sectioned, and every specimen should have a least a gross pathological report.

In addition to the almost universal routine urinalysis, however, the routine hæmoglobin estimate and leucocyte count are becoming increasingly prevalent. These, in addition to a routine examination of tissue, serve as a good basis for a minimal, routine laboratory requirement. Physicians should be encouraged to a more routine use of laboratory facilities in the hospital.

In roentgenological laboratories, the problem of adequate interpretation is a serious one, as there is an insufficient number of trained roentgenologists to supply the demand. Here also the question of supervising the X-ray technician is important. A roentgenologist should be in charge of each X-ray laboratory, even though he spends only a few hours each day there for the interpretations. The responsibility of these interpretations should be in the hands of one man, a trained roentgenologist. If left to the various physicians, the patients will not get uniform X-ray service.

The principles of the minimum standard have been adopted by over four-fifths of the general hospitals on this continent. A progressive improvement in hospitals is everywhere apparent; but there is need for a closer insight into the real meaning of these principles. Let us hope, therefore, that each hospital superintendent, each member of a board of trustees, and each physician will see more clearly his individual obligation and responsibility and that the increased co-operation resulting therefrom will bring about a fuller realization of the spirit embodied in the application of the minimum standard.

WHAT REAL AND LASTING BENEFIT HAS COME TO THE PATIENT FROM HOSPITAL STANDARDIZATION?

By Reverend CHARLES B. MOULINIER, S. J., Milwaukee
President, Catholic Hospital Association

THIS is a rather presumptive topic for a layman to have chosen and yet it is only a variation of the theme I have been talking on to medical men and hospital people ever since I have been associated with the American College of Surgeons in its program for standardization.

We must understand standardization thoroughly and deeply in order that we may appreciate whether or not it is anything real and of lasting benefit to the patient. Standardization is an external means of making things in the hospital and the work of the medical, nursing, and hospital professions more or less uniform. It is laying down rules for the conduct of the hospital, for the conduct of meetings of the staff, for the making of records and for the equipment, manning, and using of the laboratories. It is inevitable that any form of standardization should aim at some kind of uniformity. What I shall say to you grows out of my experience with the College and my observations of the great body of Catholic hospitals in charge of Sisters, some 674 on this continent, with something like half the bed capacity of all the general hospitals, and also out of the observations I have been able to make in regard to other hospitals.

This external standardization is accomplishing great things. The number of hospitals that have been put on the College's approved list is growing rapidly. All this indicates an eagerness on the part of the medical profession and of the hospital people to be on that desired list. However, it is not being on the list, it is not being surveyed and pronounced by the surveyor as fit for the list, that makes the hospital an actual agency to give every patient that which the standardization program has purposed. We all know that the aim of the standardization movement of the American College of Surgeons is to benefit the patient, but it is not going to benefit the patient, no matter what external form of standardization may be brought into the institution, until the medical profession, the nursing profession, and the hospital people actually and physiologically function as a unified institution for the purpose of helping each particular patient.

This movement is bringing about a closer coordination of laboratory and clinical medicine. The movement is making the medical man a better diagnostician and improving the results in all fields of medical practice. As fast as human nature will permit, it is obliterating the distinction between laboratory and clinical medicine. It is focusing the mind of the managing personnel of hospitals upon the importance and the fundamental character of diagnosis, and as the diagnostic ability of the surgeon, the internist, and the pathologist improves, of course the patient is benefited. As a result, the medical mind is becoming more thoughtful, more anxious, and more reserved in its diagnosis, the surgical mind is holding back surgical therapy until the diagnosis is as clear and sure as modern medical knowledge will enable it to be, and I believe that the number of operations is being reduced, and that those which are performed are done with greater skill, with greater caution, and with more finished technique, with the men performing them more thoughtful, more careful, and more conscientious. If this be true, that the surgeons are really lessening their work and improving the work that they do, what a credit, what an honor it is to the American College of Surgeons for having instituted such a movement. What a credit and honor for all those other bodies which are gradually coming to realize that this movement of the College is a genuine one, a scientific one, an unselfish one; one that is bringing to the patient what the patient had a right to—the best scientific, the most conscientious, and the most highly human service that the medical, nursing, and hospital professions are capable of giving.

Is there still room for more of these higher qualities of science, training, and care to be interjected into the so-called standardization movement? By all means. The defects of the profession of the present are just along the very lines which standardization emphasizes: organization, records, and laboratory service. The medical mind is an individualistic, scientific mind. But that does not mean that it may not be a get-together mind; that it may not be a more conscientious group mind; and that it may not be a more hearty and lofty character which puts aside all those selfish, petty, individualistic characters which are not a credit to the individuality or to the profession.

I am going to venture to say to you that the medical profession today is a profession greater in character, has developed greater individuals, is at least in its solidarity as a profession more conscientious than it was five years ago when this movement began, and is working closer with the nursing profession and with the hospital authorities than it ever did before. They are working in the open daylight; they are working with one another. The day when an individual doctor could do as he might be prompted to do and take a patient to operation without careful, considerate diagnosis and operate as he pleased with closed doors is practically gone. It exists here and there. Therefore that first essential of the College, organization, necessarily brings about the association of all those concerned with the patient so closely that individual weaknesses, individual limitations, and individual pettiness are bound to disappear.

The case record is one of the elements which is making the medical profession more careful and more thoughtful and here, also, lies one of the greatest needs for improvement. You cannot leave the making of the record to an interne, to a secretary, or to a historian. You can ask them to help you and wherever they can they should help you, but the final balancing of the facts into a safe, scientific diagnosis must come from the trained medical mind alone; and the older and better trained that medical mind is, the better. Until every one of the medical profession realizes this and is willing to assume the difficult task of being back of the record, just as he is back of the therapy that follows, the sooner will this wonderful standardization movement mean more for the patient in real and lasting benefit.

THE AMERICAN HOSPITAL

By A. R. WARNER, M.D., Chicago
Executive Secretary, American Hospital Association

ONE particular hospital may seem to be a comparatively fixed and established organization, but the American hospital as a national program of public service is a rapidly changing institution. This paper aims to place before you a few comments on present drifts, trends, or policies from angles other than the usual professional viewpoint.

Conceptions of the hospital as a form of charity and as an organized assistance to physicians in their work are now quite *passé*. The progressive hospital aims to be a factor in the public health and the medical service of the community and to make a positive contribution to the future medical and health status of the nation.

But the penalty for activity is responsibility. Just now the American hospital is in the process of finding out the responsibilities it has assumed by asserting itself and assuming an independent identity. The information is coming through Supreme Court decisions, through public demands and expectations, from the just appeals of the leaders in medical, nursing, and social service professions and from the findings in public health studies. Without question a greater responsibility to humanity, to the political state, and to the individual patient has been assumed and must be met. This does not imply any lessened or even modified personal responsibility of the physicians practicing in the hospital; rather it is new and distinct.

The American hospital, and this means a larger group than the university or teaching institutions, is assuming direct and full responsibility for the professional care of patients. No other interpretation can be placed on the admission of a ward patient. The hospital contracts to furnish the professional as well as the accessory service. The right to assume such a contract and to execute it through professional agents is not questioned. Court decisions are now quite generally (Massachusetts is, however, an exception) holding the hospital responsible for the patient to the extent of the exercising of due and proper care in the selection of agents, specifying as such "physicians, nurses and other attendants." The arguments assert that the hospital can and should know as to the competence of these agents, but it can not follow their every act.

In several cases personal damages have been collected by patients from hospitals, causing more uneasiness than is justified. The decisions are based on only two points: first, the universal principle that the hospital, as all individuals, must be just before it be generous; and second, that due and reasonable care must be exercised in the selection of agents. To this much the public clearly is entitled. This uneasiness will not affect good hospitals and will (as it should do) make poor hospitals better.

Attention is also attracted to the fact that the recent court decisions are pointedly neglecting any consideration of such points as whether the patient in question was free, part-pay, or full-pay, whether a ward or private patient, or how the medical attendant was selected. They seem to assume that the hospital acted as a responsible principal in a public service capacity and that all who ministered to the patient while in the hospital were its agents.

The proposal that hospitals revert back to the policy of assuming to give only bed, board, and accessory care was not long ago given wide publicity, but it brought no response other than condemnation. The American hospital is to stay a medical institution and face its assumed responsibilities.

All this makes the formulation of any standard, however limited in scope, of great value to the field. The hospitals were slow to recognize the value and benefit to them from the formulation and urging of the minimum standard by the American College of Surgeons. At first the standard seemed too closely restricted to the professional activities. All of it does deal directly with professional conduct, but as the professional responsibility of the hospital became better understood and accepted, the application and value of the minimum standard became more thoroughly realized. The Catholic Hospital Association first gave it support. Later the American Hospital Association officially endorsed it without reservation, and today it has our unqualified support. Any hospital not meeting this standard now keeps still about it, for it has become a measuring stick of recognized units.

That the specimen removed at operation belongs to the hospital and not the patient or surgeon has become an established principle and practically universal practice. But do we yet fully realize the obligations and responsibilities

this places on the hospital? The leading motive behind the establishment of this decision was, of course, the protection of the hospital. But ownership of the specimen cannot fail to carry with it the responsibility to use it for the benefit of the patient, for the promotion of public health, and for the progress of the medical sciences. All this is in harmony with the development of the hospital as a responsible medical institution and a part of it, yet these responsibilities are so often neglected. Laboratories and medical research are not maintained entirely for the patient, for the staff or the student—they are essential to the hospital in the proper meeting of its assumed responsibilities.

In one policy the American hospital seems to be fixed. This policy is its allegiance to the cause of scientific medicine. There has been no wavering. Last year the legislatures of several states passed bills requiring that any hospital in order to claim tax exemption must admit the patients of any person licensed by the state to practice any form or any part of the healing art and under the full control of such persons. None of these was signed by a Governor or became a law. There will be more of these bills this year to fight, but fight them we will. The sustained verdicts against hospitals have become the protectors of hospitals. If the Supreme Court of a state holds the hospital responsible for the exercising of due and reasonable care in the selection of its agents, specifying physicians as agents, hospitals must be granted the right to select these agents, the right to appoint a staff and the right to decide who may and who may not treat patients within the institution.

The organized staff requirement of the minimum standard has the universal support of the hospital groups and the indorsement of all the progressive elements of the medical profession. It is also in harmony with court decisions and principles established thereby. It must be about right.

HOSPITAL STANDARDIZATION FROM A PUBLIC HEALTH STANDPOINT

By D. A. CRAIG, M.D., Halifax
Provincial Commissioner, Nova Scotia Division, Canadian Red Cross

THE basic principle of all our public health work is the prolongation of human life and the increasing of human efficiency. Consequently, no public health work can hope to attain the maximum of success which does not have in co-operation with it the medical profession and our hospitals. You might as well try to run a railway without a department of repair and a department of research as to run a public health campaign without a hospital. You might as well try to run a railway without engines and without engineers as to work for public health without the co-operation of the medical profession and those of us interested in hospitals. There has been expressed in several parts of this continent the idea that we as a medical profession and we as hospital people are not interested in public health; that we are only interested in people who are sick so that we can make money out of them. It is up to us as members of the medical profession to prove to the public that we are interested in public health not simply by showing or saying that we will do this or that but by taking the leadership in public health and by proving to our people that we are interested in it and are willing not only to co-operate but also to be leaders in the great movements for public health, better health, better hospitals, and for better public service on the part of our medical profession. Every human being, whether he likes it or does not, is an asset or a liability in the community in which he lives. And our hospitals should return to each community, for the community investment, dividends in restored human efficiency and economic value.

I sometimes wonder if we should not sit down and consider whether our hospital this year has returned a sufficient dividend; whether in our hospital we have done all we could to see that those dividends were the highest possible, to see that we have done better this year than last. And now, if you do not remember anything else that I may say to you this morning, there is one thing I want you to remember, and that is this: *Our hospitals owe to future generations records of present experiences.* I want you to take that home with you, put it in the record room of your own hospital and in your own office, and remember that we owe to future generations records of present experiences.

Do you ever realize that we recognize the old masters today by the records they have left behind them? All our medical knowledge has been based upon records of the past and surely we will go on with that structure, building upon firm foundations for future generations to benefit by and build upon further. Now, whether you have recognized it or not, we have never realized before

how essential records are to a hospital and it is up to us to go home after these meetings, with a little more enthusiasm and interest, and to insist that we have as good hospital records as we can have, so that we will lay the foundation for the future, and future generations will bless us because we have given them the records of our present experiences.

We sometimes hear people say that the modern health ideas are all a fad and folly and that this hospital standardization program is just a fad of this American College of Surgeons. They may not see in it the move for better public health on the part of the medical profession and those interested in hospitals. To those people who would object I will say this, there is absolutely no use in throwing bricks at the sunrise for the dawn will come just the same. We have in this hospital standardization program a wonderful opportunity for public service. In our hospitals we have an opportunity to teach health and to take a part in the great campaign for health education, getting people willing to be healthy. You cannot legislate a man to be healthy, but you can teach him to be healthy.

In some of our textbooks we have chapters on anatomy and physiology, and the little folks do not know what they mean. We do not care whether the child thinks his stomach is in his body or not provided he knows when to eat, how to eat, and what to eat. And that is the kind of information we are trying to put over in our hospitals and we seek to prove to people in this country that we are interested in public health and that we are interested in their welfare, in attempting to prevent human illness and to prolong human life.

Now, let me ask you to put your enthusiasm into it, put your muscle into it, put your backbone into it, and realize that this program means a tremendous amount not only to you personally but to the community in which you live. Spread your enthusiasm to everybody in your hospital, even to the board of trustees, so that your hospital will be better this year than last, and that you will have a stronger influence in the community in which you live.

SIDELIGHTS ON HOSPITAL STANDARDIZATION

By Mr. ROBERT JOLLY, Houston
Superintendent, Baptist Hospital

I DO not know why I was given the subject of "Sidelights," but I would say that the important lights that I come in contact with in the hospital are these:

First, the lamp light represented by the patients, whose lights are flickering and dim and nearly ready to go out.

Another light in the hospital is the incandescent light, in other words, the folks who help to make the hospital go. Day and night, twenty-four hours, straight running, these lights are burning, in the operating room, delivery room, laboratory, history room, and everywhere. They do not make much noise, and they are not very large, but they are always active and ready.

The directors I would liken to arc lights. They are the big lights but they usually hang about outside. They are fine to have around but they do not shine but half the time. Out on the street when things get dark, the arc lights are turned on. So it is in a hospital; when things get dark and stormy we call on the directors and they begin to function.

The other light is the searchlight and you men of the medical profession are the searchlights. You keep prying around into places and asking questions. You search out the history of the patient before operation; you search out the patients themselves and you search again after operation. You are searching and re-searching all the time and we cannot get along without you.

I believe the greatest single factor for the protection of the patient is the minimum standard evolved by the American College of Surgeons. It is the testimony of hundreds of hospitals everywhere that it has been the greatest stimulus toward better service and closer co-operation among the factors in the running of a hospital that has ever been known.

Without co-operation it is impossible to run a hospital. I would say that the man upon whose shoulders falls most heavily the task of eliciting co-operation is the superintendent. I think I can best illustrate his position by my hand. Consider the thumb as the superintendent of the hospital. Consider my first finger as the patient, the second finger as the staff, the third finger as the board of directors, and the fourth finger as the associates of the superintendent. You will readily see that the superintendent's task is not only to co-operate with each of these four groups but to get each of these four groups to co-operate with the others.

That is no small responsibility but, in my experience, the minimum standard has been an inestimable help in doing this very thing. When a patient comes into the hospital he is likely to object to his history being taken or to the pathologist making his laboratory test. But when it is explained to him that he is in a standardized hospital and that, for his own protection, it is necessary to make these tests before he is operated upon or before any treatment starts, he usually sees the wisdom of it and begins to pride himself upon the fact that he came to a recognized hospital.

Sometimes the patient objects to a flat-rate charge for laboratory work, contending, many times, that a patient ought to be charged for just what he has received instead of an equalized rate for everyone. When they come to me about this I remind them that two of them get on a street car and pay the seven-cent fare. One of them rides three blocks and the other rides three miles; yet both are contented and do not dispute with the street car company. That usually satisfies them.

The minimum standard has already wrought wonders in the staff work of the hospitals. In many hospitals before the standard was set up, the staff meetings amounted merely to a social gathering where nothing of any real value was done and where the meeting usually broke up with wrangling. Now, however, the men know that in order to keep the hospital up to the standard, they must do a definite work at their monthly meetings, must go over the records of the hospital, and that man who has had a mortality among his patients must explain why. They also have found that each man, instead of being a star, is one of a team, and that he can count on all of his fellow workers to give him their best judgment. And so they have learned to work together.

In our own hospital, the staff has recently sent an invitation to the superintendent of the hospital, the superintendent of nurses, and their supervisors to meet with them each month for the first thirty minutes to go over ways and means for increasing the efficiency of the hospital. Not only that, but they have appointed an efficiency committee which meets with an efficiency committee of the board of directors to seek suggestions for the betterment of the hospital.

New light has come to many boards of directors as they have found that the minimum standard is something to be proud of. It is amusing but gratifying to go to many places and see the directors priding themselves on the fact that they now have a standard hospital. They have now learned that they are more than a finance committee and that they are absolutely responsible for everything that goes on in that hospital. They have found, too, that it makes a vast difference who operates on patients and that an operation is not the first resort, but the last. Since they are finding this out they are a thousand times more careful about who to put on the staff, for, if their hospital has already attained the minimum standard, they do not want to drop back and, if they have not attained it, they are putting forth every effort to do so.

The hospital superintendents over the country are finding that the spirit of the standard is getting into the hearts of their associates in management. When questions arise they are now being solved in the light of the minimum standard. In our own hospital we have a weekly council of all those in the employ of the hospital. We never have a meeting but that some question arises and in trying to solve it somebody will say, "Now, remember the minimum standard says so and so, and we must be careful about that."

I find that associates in hospitals are taking a great deal more care to explain to the patients and to the visitors the "why" of the records and the laboratory work and other things that are made necessary by the standard. They go to great pains to explain to patients coming from outside that we cannot allow just anybody to come in and operate for we must vouch for the work done by every man operating in the hospital.

So I say that the minimum standard is not only arousing enthusiasm in each one of these groups and giving them a new vision of hospital work, but it is bringing them to a point where they cooperate better than at any time in the past.

We must use as much sense in running a hospital as the large corporations are using today. We are grateful that so many hospitals of 100-bed and 50-bed capacity have already attained the minimum standard and we are looking forward to the not far distant day when all of them can hit the mark and then the standard will be raised a little higher and we will all go after that.

THE ANALYSIS OF END-RESULTS

Joint Discussion

By EUGENE H. POOL, M.D., New York, and E. A. CODMAN, M.D., Boston

Dr. Eugene H. Pool: By end-result we mean the ultimate outcome in operative cases in respect to general health, symptomatic relief, anatomical condition of the parts affected, and economic efficiency of the patient, especially the period and degree of his disability.

By analysis of end-results is meant primarily the grouping and study of the results in types of cases and operations.

To obtain these facts a system is essential entailing some labor and expense. The natural query is whether the results justify such outlay. Let us first outline some of the advantages of an end-result system and analysis and then describe the details of a system by which end-results are obtained: an answer to the query may then be obtained by balancing the credit and debit columns.

ADVANTAGES ACCRUING FROM AN ANALYSIS OF END-RESULTS

The patient. Early and regular observation and examination of patients often results in timely and prophylactic advice as well as the early recognition and correction of failures or complications. Take, for example, an incipient hernia in an appendiceal wound. Such incisional hernias if left to the patient's impulse, often become large and difficult to close before advice is sought, whereas timely repair is extremely simple and reliable. Again, early recognition of a recurrence in carcinoma at times affords the possibility of prolonging life and comfort. Such types, which could be multiplied almost indefinitely, are met with extensively in the routine examinations of a follow-up clinic. The patients not only profit greatly but appreciate the interest shown, as is evidenced by the regularity of their visits.

The surgeon. The knowledge of the results of types of operations and the amenability or resistance of various lesions to surgical efforts is of inestimable value to the surgeon. The most effective, far-reaching instruction is derived from the grouping and analysis of an accumulated mass of these cases. The failures are often disheartening because exact figures give to the failures a far more conspicuous place and a far higher percentage than is derived from impressions. Memory is not relied upon and convenient forgetfulness is impossible. Yet such truths stimulate the conscientious worker and show him his weaknesses. His work from year to year as a result becomes more reliable and careful, his usefulness being proportionately increased. We will mention two groups which have been studied on the Second Surgical Division of the New York Hospital.

Hernia. The analysis by Dr. Seward Erdman of a series of 1000 consecutive inguinal hernia operations has occupied a period of about five years. Eighty-nine and five-tenths per cent of the total operations were adequately traced. The number of return visits and examinations averaged 2½ for each case and ranged from three months to seven years.

The analysis has brought out many interesting facts. For instance, recurrences are 6.67 per cent; in oblique hernia, 3.15 per cent; and in direct hernia, 16.61 per cent. The time of recurrence in about half was within six months, 98.6 per cent recurring within two years after operation. Therefore, it is shown that a hernia which has not recurred within two years after operation can be regarded as a cure. Recurrences in patients over 55 years of age were found so high that operation is not considered advisable unless there are strong indications.

In cases of non-descended testicle treated by the Bevan method, the testicle remained in the upper third of scrotum in 80 per cent, and remained atrophic in 55 per cent.

The vast majority of hernias recur in their original type, that is, direct as direct and oblique as oblique. A direct recurrence after an oblique operation usually indicates oversight of a saddle-bag sac at the primary operation.

Hysterectomy. Dr. E. M. Hawks[1] followed and analyzed 84 cases of hysterectomy to determine: (1) what benefit was derived from leaving the ovaries, and (2) what harm resulted from leaving them. He demonstrated that: (1) the onset of vasomotor disturbances was delayed and the severity of the symptoms diminished by leaving one or preferably both ovaries; (2) very little harm was caused by a retained ovary (one cyst required secondary operation; one patient

[1] Am. J. Obst. & Gynec., 1921, i, 959-963.

experienced persistent pain referable to the retained ovary); (3) there was more trouble when the tube was removed than when it was left with the ovary. A number of similar analyses have been made.

Science of medicine. That these studies are not laboratory or experimental in nature have removed them from the attractive realm occupied by pure research, but such information and study estimated in the uplift of surgery might be fairly balanced with most of the results which reward the time-consuming efforts of the average research worker and should be subordinate only to epoch-making additions to scientific knowledge. But for such work materially to affect surgery as a whole it will be necessary to weld together the findings in many institutions, thus obtaining figures of convincing magnitude, and likewise to compare results of various institutions, some of which will afford standards to be striven for by all. To attain this ideal, the general adoption of a follow-up system is essential and likewise a somewhat uniform method for recording the results so that those of various services can be readily balanced or co-ordinated.

To summarize: The surgeon becomes more proficient; as surgery improves, the community is benefited by curtailment of economic waste; the institution profits in respect to turn-over; patients present and prospective, for whom on last analysis all efforts are directed, profit greatly.

THE SYSTEM EMPLOYED

The necessary factors are: One clerk for an average service of about 100 beds; card system; social service; follow-up clinic; collocation and analysis of mass results by special workers.

In regard to the clerk the only feature to emphasize is that the volunteer worker is inappropriate and salary is therefore necessary. The social service department is an essential part of every hospital and either exists or should at once be installed in every institution. Its follow-up work is a detail, not the reason for its existence. It is used to pursue such cases as resist summons by card. In 1921, after seven years' experience with the follow-up work we followed 95.7 per cent of all post-operative cases. Seventy-seven and seven-tenths per cent reported in person; in 20 per cent of the total the social service was called upon for help. They obtained information concerning 88 per cent of those referred to them. The card system is of necessity complicated but is quickly mastered by the clerk. Various systems have been published and need not be reviewed. They do not differ in essentials.

The follow-up clinic is the most essential feature but is likewise the stumbling block. We find a weekly Sunday morning clinic best, since the working classes are free and prefer to come then instead of at night after a day's work. The staff alternate so that no attending is on duty two successive Sundays. Two of the attending staff, three of the house staff, and one nurse serve each Sunday from 10 to 12. Regular attendance with enthusiasm and kindness in the work is the difficult factor to perpetuate week after week, year after year. It is this feature which has resulted in the breakdown of such systems as have failed.

The grouping and analysis of results should be carried out by the allotment of subjects to men on the staff and outside workers who are interested in special subjects. A system by which summaries of all important types of cases may be kept up-to-date is not difficult to carry out, and such analyses should be published.

To summarize, the advantages of end-result analyses are overwhelming and incontrovertible; the expense insignificant; the labor considerable but worth while. The factors which have militated against the general adoption and continuance of such an obviously good system are the frailty of human endeavor, often called staying power, and the lack of anything individual and effulgent in the results. For the system demands team play, not individualism, and depressing failures and disappointments rather than adulation and successes are the outstanding and yet useful elements in the analyses of the follow-up clinic.

DR. E. A. CODMAN: Seven years ago the Clinical Congress of Surgeons met here in Boston. At that time the Committee on Hospital Standardization presented a report recommending a classification of hospitals into two divisions: (1) those which make an effort to find out what kind of results they are getting, and (2) those which do not. During these seven years the American College of Surgeons has made great efforts and spent many thousands of dollars on a far more complicated plan.

It is an unpopular task to criticize this movement of so-called standardization of hospitals now that everybody is doing it, just as it was an unpopular task to cry aloud to have it done. With all that we have heard and read about hospital standardization, could we today really make a preliminary classification into those which analyze their results and those which do not? Are there not still marble halls in the approved list of the College where the individual patient is only

"material," and in which analysis of the results is ignored?

Unquestionably this standardization program has helped many a hospital to raise money for laboratories and equipment. It can be made to appeal to the bankers and idle-rich of any community. The ideas expressed in the minimum standard appeal to practical common sense and reach the lay audience; undoubtedly money has been raised thereby. But has the essential idea of analyzing the end-results *in order to improve on them* been lost sight of? If today we went back to the suggestion of seven years ago and classified hospitals into those which care to follow up and analyze their end-results and those which do not, I fear we should find a much smaller approved list than we now have.

Real analysis of end-results means too much hospital "shake-up" to be taken too seriously. "All is not gold that glitters." The successful practitioner of medicine or surgery is still an accomplished diplomat and it is such men who still control the policies of most hospitals. The public benefactor is not yet ready to listen to the efficient, studious analyzer of results, but has the greatest respect for the cheerful and wise practitioner whose good common sense "saved" his baby "from having pneumonia," or who kept his neurasthenic wife from knowing the baby had pneumonia until after all danger was over.

After all, for whose interest is it to analyze end-results? Of course, the patient, medical science, and that abstract entity "the hospital" would all benefit. But no one can deny that the staff would earn less, would work harder, and would feel themselves bridled and harnessed with the trustees holding the reins. So, too, in the case of the trustees there would be more trouble. They would be obliged to hold the reins gently but firmly, on these newly harnessed horses. It would be far easier for them to leave the horses to feed themselves out in pasture as at present. They might employ a first-class hospital superintendent as coachman who would make the horses comfortable and contented and ready to prance when he cracked the whip; but even then it would be more trouble for the trustees, for they would have to watch the coachman as well as the horses. And as for the coachman, where is the ambitious hospital superintendent who wishes to drive a staff and be responsible for keeping them well groomed and contented! Most hospital superintendents rather have the animals out in pasture.

So, though it appears certain that the patients, medical science, and each hospital would be benefited by an end-result analysis of all cases, it is also true that staff, superintendent, and trustees would all be temporarily the losers.

There is a peculiar personality in a hospital called, "They"; "They" ought to do this and "They" ought to do that. It is this "They" who ought to analyze the end-results. "They" should discharge the incompetent; "They" should promote the efficient. In your hospital who is "They"? In most hospitals, I fancy "They" are utterly intangible and are usually friends of the trustees who hold positions on the staff, and who work confidentially with influential members of the trustees, rather than through the regular channels of staff meetings. "They" as a rule do not wish for searching end-result analyses. One seldom wishes for a thunderstorm for it may strike near home, and yet, if it is inevitable, we take it calmly enough.

The end-result system is something like a thunderstorm. It is an unwished-for hospital guest. It is blown on us by the winds of progress and is inevitable. Let us accept it, since we have to, with the best grace we can. Even if we in this generation treat it as evasively as we do prohibition, let us accept it for the next generation; but let us make it a staff policy and not make it necessary for the trustees to drive or to hire a coachman. Let us take the joy of the fire-engine horses to have the harness on our backs and "run with the old machine."

FUNDAMENTAL PRINCIPLES INTERPRETED FROM THE HOSPITAL STANDARDIZATION PROGRAM

By MALCOLM T. MacEACHERN, M.D., Vancouver
Associate Director for Canadian Activities

I AM going to summarize with lantern slides the fundamental principles and results of hospital standardization. (*Illustrated with lantern slides.*)

1. *Organization*—organization of the professional group in the hospital is effected, thus tending to stimulate better organization throughout the other groups working therein.

2. *Ethics*—a higher type of ethics among the professional group is developed which reacts beneficially, not only on the internes and nursing staff, but also on the patient and fellow members

of the profession by an inherent desire and habit to practice medicine honestly.

3. *Self-government*—a system of self-government is established among the professional group which today is recognized as a type fruitful of best results.

4. *Efficiency*—efficiency in all professional work carried on in the hospital is demanded and this reacts in a stimulating manner on the general efficiency of the entire institution.

5. *Co-operation*—a spirit of co-operation is promoted—a fundamental principle for success throughout the hospital which primarily affects the medical group and rapidly embraces all others concerned in the welfare of the institution.

6. *Investigation*—investigation of all matters pertaining to the professional work in the hospital, whether good or bad in quality, is required so that an intelligent balance sheet of results of treatment can be obtained.

7. *Regularity*—regularity in staff procedure by meeting at regular intervals is made imperative.

8. *Helpfulness*—the fact that the program is one of helpfulness to the weaker members of the profession is always emphasized, demonstrating that it is inclusive rather than exclusive in its scope.

9. *Communalism*—a spirit of communalism is stimulated among the medical men working in the hospital and this is much needed today.

10. *Consultation*—the habit of consultation between individuals or groups of the medical profession is promoted, thus reacting beneficially, not only for the patients concerned, but for the stimulating of clinical interest and the advancement of medical science.

11. *Check-up or audit*—a careful check-up or audit of all the medical work is demanded to determine the net results of the application of medical science in the institution.

12. *Cohesion*—better cohesion is secured among the individual members of the medical profession practicing in the hospital through staff organization and staff conferences, which materially stimulate and strengthen the local, state, provincial, and national organization of medicine, all of which is so much needed today to promote health and scientific medicine, as well as to rid the country of the quack.

13. *Accuracy and thoroughness*—accuracy and thoroughness of work is demanded by careful study of the cases to make a correct diagnosis, thus applying more intelligent and competent treatment ultimately to produce the best possible results.

14. *Confirmation*—the doctor is provided with facilities for confirmation of findings through human or physical methods of investigation.

15. *Research*—a spirit of research is developed through the stimulus of clinical interest as well as the greater availability of accurate scientific data which otherwise might be passed over or not discovered if the method of procedure laid down by standardization was not carried out.

16. *Conscience*—a more profound professional conscience in the hospital is established.

17. *Hospital perspective, objective, or focusing point*—the fact that the patient must be the perspective, objective, or focusing point of all hospital services is emphasized.

By means of the monthly analysis or audit the hospital can prepare a practical, business-like summary of its results. A suggested form follows:

PHYSICAL BALANCE SHEET

Physical Report of Hospital for month of August, 1922.

(A) Volume of work:

Admitted	Died
Discharged	Remaining
Transferred	

(B) Physical Assets:

Cured	Improved

(C) Physical Liabilities:

Unimproved	Infected
Complicated	Died

(D) Net Results—Physical Surplus or Deficit.

Certified correct and all details thereof duly investigated by the Medical Staff of the Hospital, this...day of....., 192..

(Signed)_____
Chairman of Staff.

(Signed)_____
Secretary of Staff.

To summarize, this standardization campaign has amply demonstrated a definite economic saving in addition to the well recognized improvement in professional care. This may be expressed in the following manner:

Net Physical Results of Hospital Standardization

1. Lessened days' stay of patients in hospitals;
2. Elimination of incompetent and unnecessary surgery;
3. Reduced number of complications and infections;
4. Lower hospital death rate.

AFTERNOON SESSION—ROUND TABLE CONFERENCE

CONDUCTED BY MALCOLM T. MACEACHERN, M.D., C.M., VANCOUVER
Associate Director for Canadian Activities

SECTION A—STAFF ORGANIZATION

BY FRANK D. JENNINGS, M.D., BROOKLYN

THE topics for discussion under staff organization are divided into six questions. I will take up these questions separately:

1. Because of the different varieties of hospitals and because of the number of doctors attending, in certain instances difficulties often arise in the selecting of the exact type of staff organization best suited to local needs and conditions. Are there any guiding principles that would help in this matter?

Taking hospital conditions on the average throughout the country, there are three types of hospitals: the closed, restricted, and open types. The closed hospital is generally a well organized institution, and may be dismissed this afternoon with just that reference. We will best serve the interests of this discussion by thinking of hospitals with either "restricted" or "open" staffs. In the East I think the restricted hospital is more common than the open and the converse is true in the Middle West and the far West.

Now, the restricted hospital, which is the type of hospital that I am connected with in Brooklyn, is administered somewhat in this fashion and I believe that if I recount to you that method of organization it will simplify the discussion.

There is, first of all, a board of trustees, lay and ecclesiastic, under which is a medical board composed of the attending staff members in the various services. The medical board is charged with a fixed and definite responsibility for the medical and surgical care of the patients entering the hospital. All the details, all the other subdivisions of the hospital, function under the medical board, the interne staff, the nursing staff, the dispensary staff, and the courtesy staff. The courtesy staff is composed of men to whom are extended the privilege of caring for private patients in the hospital, and the character of the courtesy staff frequently, too frequently, determines the standards and standing of the hospital. The men of our courtesy staff are appointed after recommendation by two members of the medical board, and after approval by the whole board they are nominated by the board of managers. The appointments are for one year. This is a simple but efficient organization.

The board of trustees says to the medical board, "Take care of the medical and surgical affairs of this institution and account to us."

Now, an open hospital is perhaps different, but the underlying principle is just the same because it simply means organization. It means getting those men who compose the professional staff of that hospital together in an organization, which need not be complicated, the simpler the better, with a constitution and by-laws.

2. One of the ultimate objects of hospital standardization is to promote a more constructive professional interest in the hospital by the doctors attending. To this end is it advisable to make more or less division of professional responsibility by dividing the staff into representative committees to look after various phases of the work, as for instance: medical committee, surgical committee, laboratory committee, records committee, etc.?

An efficient organization cannot operate successfully in any other way. A chamber of commerce, a rotary club, a large banking institution, or any large mercantile organization will function that way, and we do not differ in any sense. We are charged with the solemn responsibility of caring for sick people. That necessitates organization and it means as good an organization as we can construct. Referring again to my own hospital and the experience that we have had there, I may say that we have found that we need an executive committee. It is obvious that there must be some committee representing the medical board between meetings. It consists of the president and secretary of the medical board and one member-elect.

Secondly, the most important, is an efficiency committee. Only within the last year have we reorganized our system of distribution of work through committees.

Medical groups do not differ essentially from other groups. Some men will work, some will not. We had a committee on internes, committee on laboratory, committee on operating room, and so on. The chairmen used to work but the other members of the committees did not. It occurred to us that it would be very much more sensible to

combine in one committee all the functions that had been distributed in a large number of committees; so we appointed an efficiency committee composed of a chairman and four members. To one man is assigned internes, another the nurse training school, another the laboratories, including the diet kitchen, and another the operating rooms. The chairman exercises general supervision, presides at committee meetings, and correlates the work of the committee.

This committee has functioned beautifully. It has simplified the work because, assuming that committees are composed of three or four, we can get five men in a hospital group who will be active, efficient, and interested, where we cannot get fifteen or twenty. Now you will notice that this combines what I may term the intramural activities of the hospital. The dispensary committee is a separate committee and properly so, as its work is extramural. The efficiency committee does not include one extramural phase. The staff conference committee, because its work is so important and essential, combining as it does the necessity for arranging the monthly program for staff meetings and in addition the supervision and care of the records throughout the hospital, was made a separate committee.

3. Many hospitals, and especially those without a medical superintendent, are at a loss to know how to initiate staff organization and staff conferences. How best can these be initiated?

The way to initiate is to *initiate*. What advice can be laid down that will supply the professional staff the stimulus to do this thing if that professional staff lacks the interest, lacks the determination, lacks the will to do it? That is what counts. If your staff is right you do not have to initiate organization because the staff will do it and the staff will see the inherent necessity and inherent good. Suppose the French at Verdun had said, "We hope they will not pass." What might have happened? What did they say? They said, "They shall not pass." There was a concrete illustration of national determination of a thing that had to be done. And in a small matter it is the same.

4. The staff conference to be a success must have certain agenda on its program and definite lines of procedure. What, therefore, is the best type of agenda and method of procedure for such a conference so as to obtain the best results?

This is a broad question, difficult to answer, but taking the average hospital conditions throughout the country, in perfecting your staff organization perhaps the first thing you should do is to make the records better. That was our situation; our records were very bad; we found at the beginning that the type of conference devoted to mortality discussion was the most practicable, the most satisfactory, the most stimulating, and in the end the best, for it not alone created a condition whereby a man had to face his mortality but it made him more careful of his record. It has been of remarkable interest through these years to see the records come from conditions of absolute oblivion up to a fair degree of perfection. So that in the average general hospital at the beginning the mortality type of conference is the best.

Going on from that you come to the time when it begins to lose its interest. The records have come up nearly to par and your staff review analysis at the end of each month may not show more than fifteen or sixteen incomplete records in a month as against eighty or one hundred before. Then, perhaps, comes the consideration of morbidity and, in the last analysis, the staff review. So that I should say that the agenda should consist of, first, the staff monthly review; second, mortality; third, morbidity, and then the staff analysis or study of the staff work in that hospital. Not what somebody is doing in Vienna, not what somebody is doing in other cities, but your own staff review of its own work. That is the best.

5. Many staff conferences in hospitals today are poorly attended, evidently due to lack of interest and enthusiasm. What are some of the methods being used for stimulating interest and enthusiasm in staff conferences?

A good staff conference committee and a good program is all you need. If you have the right kind of committee and right kind of chairman with initiative and energy and the right instinct, you do not have to worry about the program. They are up to the mark all the time. Staff review opens up a field as wide as medicine. Take a review of hernias, for instance. We heard something about it this morning from one of the surgeons in New York, which shows what staff review means, and it is to the credit of that hospital and that surgeon that he publicly proclaimed the results. It is healthy, helpful, and honest. Without honesty in your staff nothing else counts.

6. Hospital standardization recommends and requires an analysis of the work during the previous month or period. What should this analysis contain and who should prepare it or present it?

We believe that it should be prepared in the record room. It is our custom that it be written

on a large blackboard and it is the first order of business taken up at a staff conference. It comprises the total number of admissions, the total number of discharges, the mortality, the number of operations, both in general surgery and special branches of surgery, the number of laboratory examinations, and the number of ambulance calls; in brief, it is a statistical study of the work of that hospital for the month and the chairman usually devotes a few minutes to its consideration, which is very stimulating. The whole thing simmers down, it seems to me, to honesty of purpose and to earnestness. We heard this morning concerning the five lights of hospital standardization. Well, there is a sixth light, and that is the light that is ahead of us all the time—the goal that we are aiming at—good hospitals and good work.

DISCUSSION

DR. WALTER E. LAMBERT, New York: Dr. Jennings said there is first of all a board of trustees with the medical board subject entirely to the trustees' orders; that the medical board is given the authority to conduct the medical work of the hospital. What authority has the medical board in the general conduct of the hospital and are there any medical men, members of the staff, who are members of the board of trustees? That is a very serious question which we all recognize.

DR. H. WELLINGTON YATES, Detroit: May I ask the essayist to discuss for us the question of mortality in relation to the monthly staff review and the staff meeting? Should these matters be discussed freely before all the physicians present and should there be a free discussion and criticism of the results obtained by various staff members?

DR. EDWARD W. MULLIGAN, Rochester, New York: We have as high as 70 per cent attendance all the time. The men in the hospital who do the best work are always in attendance. We take up the mortality every Sunday from 12 to 1 o'clock but make it short and bring in as many patients as we can. It is at the monthly meeting that we take care of the work which you are discussing here. Is this a good thing to do? Is it a better way to do it at the Sunday meeting or is the monthly meeting better? Are we doing something that the rest are not doing? Is this weekly meeting attended by all the members of the staff, a better thing to do than to have monthly meetings alone?

DR. SOUTHGATE LEIGH, Norfolk: Infection occurs entirely too frequently, even in the work of the best operators, and in high class hospitals. This is due to several causes, such as inattention to surgical cleanliness because of its extreme simplicity, multiplicity of operators, etc., but chiefly, I believe, to the fact that but few hospitals have the proper staff control of the operating department.

Years ago in each principal hospital there was usually one dominant figure in the surgical department, who ruled the department by force of superiority and high standing, and whose hobby was the operating room and its detailed direction and control. Today in each hospital there are several high class surgeons, all standing practically on the same footing. The management of the operating rooms, however, is suffering. What is everybody's business is nobody's. Some hospitals have already recognized the danger of the situation and have appointed in each a staff operating room committee, but rarely with the proper authority.

What is needed is this: that member of the staff who is an enthusiast on the vital subject of surgical cleanliness should be selected and put in charge of the operating department and he should be given sufficient authority to control every detail of its management. The operating room nurses and assistants should be constantly under his supervision and direction, and in a judicious manner he should make such simple rules as may be necessary for the guidance of the surgical staff.

This is an exceedingly important matter for which I would ask the earnest consideration of the College. Time permits me only to mention the principle of the plan without considering its many and weighty details.

DR. FRANK D. JENNINGS, Brooklyn: Answering Dr. Lambert, his question, as I understand it, involves medical representation on the board of trustees. Our medical board is not represented on the board of trustees. Our board is lay and ecclesiastic but not medical. It seems to me that under average conditions lay control gives about as satisfactory a result as any. I presume you have seen, as I have, medical politics in hospitals and other places, and while perhaps lay boards may at times go astray, my feeling is that in the end average justice is done just as well by a lay board as by a medical board or a board with medical representation. I do believe that perhaps one medical representative would be good. I know of one hospital in Brooklyn which has that type of organization and I believe it has functioned very well. We get around it in this way: our board of trustees designates one man as executive member; he is the link between the board of trustees and the medical board. He meets with the executive committee of the medical board which is composed

of three, making a small committee which functions very rapidly and avoids much lost motion.

Replying to Dr. Yates, I believe there should be a frank discussion which is the practical way in which this program works. I do not see any reason why any member of the staff who has operated on a patient who died subsequently should not stand up frankly to answer any question that any member of that staff may ask as to why he did that thing or why he did not do it. This, it seems to me, is the essence of the whole proposition. But we go further; we have a little reading stand on the platform with a light overhead so that it casts its effulgence right over him.

Answering another query, we include morbidity and I believe that it should be included. This is a review of the work of the staff. We have had very striking examples of morbidity, perhaps embarrassing to the man involved but very illuminating and helpful to us all.

In answer to Dr. Mulligan, I think they are very fortunate in his hospital in being able to have such a satisfactory attendance each week. We have thought of it because often with a conference held once a month the work of a given month, particularly between November and March, may be too extensive for one meeting and we have considered whether it would be a good proposition to meet weekly. I still feel that with the multiplicity of meetings that a medical man has to attend we would do better in many instances by adhering to the monthly meetings. In many of the larger hospitals they have departmental conferences once a week but they take into consideration only their own departmental work. But the monthly meeting goes along for the whole staff. I think there is a field for the weekly service conference and indeed a field for the conference you hold and you are fortunate in doing it so successfully.

SECTION B—CASE RECORDS

By GEORGE A. RAMSEY, M.D., and ROY C. KINGSWOOD, M.D., London, Ontario

DR. GEORGE A. RAMSEY: A hospital may be described as a public utility filling a position of need. As such, its function is to give efficient service. In that service, how do records function?

The patient has the priority of claim and has the right to expect such thoroughness as is included in an effective record. The physician fulfills a duty to himself in giving to the patient such study of the diseased condition as is outlined in a record. The public, whose institution the hospital is, has a right to feel secure that the procedure therein is thorough, painstaking, and logical, in order that conservation of life may add to the community asset.

The institution needs to know that it is discharging its full duty to the community through its staff and officers to the end that efficient service may become its tradition in perpetuity.

These are axioms and it is with their application we are concerned. Records are financial, social, and medical. With these last I propose to deal.

While mindful always of the requirements of the standards set by the American College of Surgeons, I want to warn against records kept merely as so much manuscript with no attempt at application. Likewise would I add my protest at any attempt to make the hospital fit the record, and not the record to blend with the character of the hospital.

In arriving at what might serve Victoria Hospital, London, we made an analytical examination of at least thirty sets of hospital forms and chose what seemed most applicable to a municipal hospital of 400 beds for public and private patients, comprising the whole series of types of service, selecting what seemed to meet our particular needs, discarding much and here and there contributing some little thing that appeared to warrant a trial.

There was an effort made to link in harmonious union with hospital records those documents required in dispensary and follow-up social service. We had the satisfaction afterward of seeing almost an identical system described for a hospital that compared with ours in size and service.

The requirement which guided the adoption of any form was that it should be simple in legend and complete in the outline which should guide the investigator, leaving always scope for individuality. I protest against such efforts toward standardization as would stamp out individuality. Again, in the interests of economy, time, and money, we endeavored to secure such procedure as would make every single effort at record, from admittance slip to discharge certificate, a constant working tool and a permanent document. It is easy to carry system to such a degree that it enslaves. Re-duplication may weary and discourage even the most energetic.

The end purpose of a record is a diagnosis, demanding complete, prolonged, and detailed study of the patient from physical, mental, and psychological viewpoints. In this evolution of analysis the record should always be a guide to investigation, an adding machine of daily and hourly observations to the ultimate totalization of a diagnosis of the patient, not alone of his disease; and it does not stop there. Treatment follows on the conception of the cause, course, and expected outcome of the condition and is varied to meet its changing phases. If, then, it gives proof of intelligent endeavor, it deserves to be history; and if it fails, simple honesty likewise requires a record of what has been tried and found wanting.

I wish to quote Dr. Emerson's definition of a record: "It is not our imagination or our memory of past events but a painstaking entry on imperishable human documents of what is at the same time the glory and the humility of medicine, the truth as we see it, when we see it, the facts as our faltering and unskilled senses take note of it, whether in the immediate presence of suffering humanity, or at the operating or autopsy table, while still the echo of the laboratory test is knocking at our conscience. The present is ours to record. Tomorrow it belongs to the past."

Father Moulinier very strikingly has given the following definition: "Records are facts that you find, that you filter, that you focus, and then face fearlessly."

I wish to acknowledge the pioneer work of the late Dr. J. L. Stapleton in laying the foundations of our record system in Victoria Hospital, London. This was carried on by Dr. J. R. N. Childs, and I acknowledge gratefully also the sympathetic support of trustees, staff, internes, and record clerks in making the effort possible.

We have a few slides to show the cogs in the machine of our system of records following which Dr. Kingswood will demonstrate their workings.

Dr. Roy C. Kingswood (remarks illustrated by stereopticon slides): Dr. Ramsey has given you the machinery necessary for a carefully designed hospital record system. We shall now attempt to show how easily this machinery works at Victoria Hospital, London, Canada, after it has been carefully oiled and lubricated. Even the minor manufacturing concerns have men in their employ to whom they pay substantial salaries, who do nothing else but check and record the materials, cost results, and other data concerning their manufactured product. If business men deem it necessary to exercise so much care in the record of the process of manufacture of their article, how much more careful should be the medical men who are attempting to repair the human body so that a definite record should be kept of the attempt at repair while in the repair shop, namely, the hospital. Also how essential it is to the patient that a repair record should be kept for any necessary future reference. We thought our method would be best explained if we were to take an actual case and follow it through the hospital from the time of admission until discharge.

Slide 1. Mr. John Doe enters the hospital on July 1. The necessary notification has been given to the attending physician and interne. The interne visits the patient, not with a huge pad of record papers in one hand and a fountain pen in the other, but purely to meet the patient and become acquainted with him, make sure that his wants are being supplied and to find out the nature of his case. This gives the interne his approach to the patient and then a short while later he is able to obtain a history which is a real record of the patient's condition. The history embodies, first, the present complaints, second, the onset and course, and third, the previous illnesses and family history.

Slide 2.—Physical examination. The interne then proceeds to the physical examination which we require to be complete and if there are any findings in his examination which are not absolutely clear we require that he consult one of the senior men. Perhaps the two most important notations on this form are: first, the working diagnosis (after physical examination). We require that the interne write down his provisional diagnosis after he has summed up the case and that he adhere to this diagnosis until someone who knows more about the case proves that he is wrong. In this way he gets his training and is encouraged to think. Second, the signature of the staff physician. This proves to the interne that the visiting physician has been sufficiently interested in his work to read what he has written.

Slide 3.—Progress notes. This is a record of the patient's general condition, post-operative course, and condition of the wound and includes the opinion of any doctor who may have been called in consultation. We require that these be written at least every three days.

Slide 4.—Operative record. This is a concise, detailed record of the procedure and findings at the time of operation. Dictation is carefully given by the surgeon or senior assisting interne immediately after the operation.

Slide 5.—X-ray report. A report from the department of roentgenology would also be found on

the chart. A miniature reprint of the plate accompanies each report.

Slide 6. —Laboratory findings. The laboratory findings are recorded as seen and include urinalysis, blood, serological, and other reports. The interne is responsible for much of the laboratory technique.

Slide 7.—Temperature chart. The patient's temperature, pulse, and respirations are kept as above; also a record of the number of stools, urinations, and other similar data.

Slide 8.—Nurse's record. A record made by the nurse of the patient's general condition, medication, treatment, and doctor's visits, and other associated notations.

Too much cannot be said for the nurse who carefully records the condition of the patient, as she sees the patient oftener than the doctor.

Slide 9.—Dental record. To make our record complete we have a post-operative record of dental examination and any extraction, prophylaxis, etc., done at the dental clinic.

Slide 10.—Chart folder. On the discharge of the patient, the interne is responsible for checking the chart to make sure that all the records are complete. It is then placed in the above envelope, properly filled in and the discharge diagnosis completed and presented at the record office for the approval and signature of the director of records.

Now just a word as to how we obtain these records.

Slide 11.—Internes on wards taking histories. The interne has tried to win the confidence of the patient by his gentlemanly and professional approach.

Slide 12.—Internes making physical examination. We require that a nurse be present at the examination of all female patients and that the patient be draped in such a manner as to insure a careful examination and yet not offend the delicacy of the patient. In this way we have no trouble with our private patients.

Slide 13.—Convenient place to write records. This plate shows a sun parlor adjacent to a ward where the internes may write their histories without being disturbed; many discussions of the various cases take place here.

Slide 14.—Record office. One corner of the record office showing an interne dictating a history just completed and the other interne giving the operating room report immediately following an operation.

Slide 15.—Group of internes on the surgical service analyzing the records of all cases of carcinoma of the breast admitted in 1921 with the idea of publishing their results. This leads to staff conference analysis and promotion of scientific research.

Slide 16.—Operating room scene. This patient had a laparotomy performed two years ago and probably just as important a factor as the proper technique of opening the abdomen is the previous operating room report to show what pathology was found at that time. The interne is reading this former report in detail.

Slide 17.—Cost of chart system. The cost of our system is 51½ cents per patient per year.

Is it not worth while from your standpoint, fellow practitioners, to know that a complete record of your patient is being kept while in the repair shop? Is it not your duty to make sure that these records are written for your patients wherever you may send them—even if you have to write them yourself? And you who may be patients in the repair shop—do you not consider for your sake that these records should be kept?

SECTION C—CLINICAL LABORATORIES

By JOHN F. BRESNAHAN, M.D., Bridgeport, Connecticut
Superintendent, Bridgeport Hospital

THE following questions have been assigned to me in the discussion of this subject:

1. In some hospitals today there are very fine laboratories capable of doing all the services necessary, but not much used by the medical staff. What methods can be employed to stimulate increased use of such laboratories by the staff?

In a great many hospitals one finds the laboratory located either in the basement or in some part of the grounds other than in the main hospital. The pathologist is present in his own little department but does not come in contact with the patients in the wards. He sometimes, but rarely, leaves the laboratory. The specimens, whether tissues or blood smears, come to him without any connection with the patient whatsoever. He has not seen the patient, and the slip sometimes merely names the part of the anatomy from which the specimen is taken but no other information is given. He gets into the habit of looking at these samples as having no connection with anything else except the container in which they come. He then tries to guard against mistake, and in order to avoid being mistaken he very often will first hedge, and then incline to give an affirmative diagnosis only in case the indications are very marked. The pathologist and roentgenologist should be consultants and when we have our pathologist coming in contact with the patient as consultant, then I think we will clear up that first question. In our hospital the pathological laboratory is a service of consultation, for example, the consultation slip goes to the pathologist, and he sees every patient from whom blood is taken and can give a better opinion on border line reactions than if he never saw the patient.

2. There are various systems used in our hospitals for making laboratory charges; some according to schedule of prices per test or examination, and others by means of a flat rate. In the opinion of many the method used in making laboratory charges has a direct relation to the laboratory service. What, therefore, is the most desirable method to adopt?

The hospital superintendent generally has to face a deficit. When the deficit is a little larger than expected (as it is every year) he has three methods of approach or three methods to solve the problem. First, he attempts to reduce the price of food, and the quality of food is apt to fall. Next, he raises the rates of private rooms; and, next, he inspects the laboratory charge to see how he can split it up and make an extra charge. So that where it used to be a two-dollar flat rate fee they now split it into three or four items of one dollar each. What happens to the patient who comes in with an obscure disease for which a number of laboratory tests are necessary? He is penalized, so to speak, for having an obscure disease, and the number of laboratory tests raises the cost for that patient, which is not right. After all it seems as though the limit for charging patients has been reached. If the laboratory tests necessary for diagnosis are costly, out of proportion to what the patient pays, instead of trying to get the patient to pay more we should go out for a definite campaign either to endow that laboratory or to collect money for the purpose.

In too many hospitals the laboratory charge is gradually increasing. A doctor says: "I would like to order a fluoroscopic examination, but the patient cannot afford to pay for it." Or, "I would like to have that tissue sent away to a reliable laboratory and have it checked up. It does not look like carcinoma, and I would like to be sure of it." But a little extra charge of ten dollars determines the matter in the mind of the doctor as to whether that patient shall have a laboratory examination.

One of the best ways to do it is to have a low flat rate for each patient, say two dollars, and let that include everything and if the laboratory is not self-supporting let us make it so and not ask the patient to pay more.

3. There appears to be no definite information as to the extent to which routine laboratory examinations should be carried out. What is the general opinion in regard to this?

I do not think anybody can answer that question except the staff of the particular hospital involved. It may be a wise thing in some communities to have a routine Wassermann examination of all ward patients and it may be necessary sometimes to make exceptions to that rule but it works out in most cases. I do not think that question is answerable except in particular hospitals where the staff can meet and adopt a routine

procedure which fits that community. But there is one routine procedure which can be adopted to advantage and that is in the maternity department; when a woman is delivered and the cord is cut, a test tube is held under the cord and part of the blood allowed to run into it. This blood is sent to the laboratory and thus one is able to detect specific disease and start treatment immediately for both the mother and child.

There ought to be no question that a hospital should require at least a urinalysis, hæmoglobin determination, and leucocyte count. To my mind there is no question, in fact, it is absolutely essential that every piece of tissue removed in the operating room should be sent to the laboratory for examination. This examination, at the minimum, should consist of the gross pathology, and a report of the microscopic examination.

4. Many small hospitals today have considerable struggle carrying on a laboratory service for their institution, especially when there is no highly trained pathologist or bacteriologist in the community. Many also are anxious to know what facilities should be provided and the extent to which the service should be extended. Therefore, how far should the small hospital go in its laboratory service? What facilities should be afforded and what personnel?

In a small community, especially hospitals in the country, it is sometimes necessary to induce some of the younger men who have had good training, to specialize in laboratory procedure, or to go away and take a course in laboratory technique. Almost any hospital will take as an assistant a young physician who wants special training of this kind. Then he can go back to his own community and supervise what is being done in the laboratory. Specimens which may have to be sent to a city laboratory, for example, can be reported on by telegraph if necessary. If the situation will warrant it the doctor can take one of the nurses in the hospital and show her the routine necessary for simple laboratory procedures, sending specimens requiring highly technical examination to the state laboratory or to a good ethical laboratory under private auspices.

In our own hospital we have two graduate nurses who serve in the laboratory. These nurses have been taught to make the routine blood analysis and other tests. One of these nurses works one week in the laboratory and the other week alternates in taking routine histories in the wards. It works out very well. These young women can be taught the ordinary laboratory procedures and when internes are not available they will be found valuable aids to the hospital laboratory if they are checked up in their work by the pathologist of the hospital, not once a month or once a week, but every day.

SECTION D—ROENTGENOLOGICAL SERVICE

By WILLIAM A. LaFIELD, M.D., Bridgeport, Connecticut

IT has been suggested that our discussion of this subject be limited largely to the extent and supervision of X-ray service in hospitals. Accordingly, our program contains the following questions to guide our discussion:

1. Hospitals today are asking what should constitute a complete service in an X-ray department. Should all institutions be able to perform fluoroscopic examinations, gastro-intestinal work and treatment?

2. In many hospitals today the X-ray department is under the management of trained technicians. It is generally stated that interpretation of X-ray plates can only be done successfully by the trained medical man. In such places as cited, interpretation has to be left to the individual physicians referring cases. Is this satisfactory, and can you have an efficient X-ray service in this manner?

I have great reluctance in coming before you and attempting to give precise answers to some of your problems as to the X-ray laboratory in a small hospital. May I say first a word as to the responsibility of the roentgenologist. In the first place, the responsibility for the service must be left to a competent roentgenologist who must be a graduate physician well versed in anatomy and physiology; he should be a competent physician, so that he may study with you the essential data regarding his X-ray finding and give you an intelligent interpretation. He must have a fair working knowledge of radio-physics. He must be a good amateur photographer, something of an electrician, and something of a politician. The technician—the individual who does the routine work of the laboratory—should be a graduate nurse trained by a roentgenologist and should follow a definite routine technique in all roentgen examinations; and she must work under the supervision of an attending roentgenologist. She must confine her activities entirely

to X-ray practice. She must work under such supervision that she will realize her limitations and responsibilities.

With a hospital of perhaps 100 beds or in a community of 25,000 or 50,000, it is not usual to have a man giving his entire thought and attention to the practice of roentgenology as a profession. A community as small as that will not adequately support a man doing roentgenology as a specialty. In any hospital measuring up to the standard of the American College of Surgeons there is no reason why this department could not be placed under the intelligent supervision of a roentgenologist who is not necessarily an active member of the hospital staff. He may be a man in a comparatively remote place from the hospital he serves. It seems to me the first plan would be to establish a small department under the immediate supervision of a graduate nurse who has been trained in this work.

Perhaps we can best bring out the answer to the first question, "What should constitute a complete service in an X-ray department?" by giving you first the limitation of your roentgen service. There is no doubt in the mind of every man doing extensive work in this line that every hospital should be equipped to do roentgenological examinations of the gastro-intestinal tract, chest, skull, and the urinary tract. Some hospitals leave the entire charge of roentgenology to a technician. Would you rely upon the opinion of an orderly or a nurse for an interpretation of the changes in the renal pelvis? Would you rely upon the opinion of a high school graduate, not a graduate physician, as to the significance of a tuberculous lesion in an extremity? In my mind there is no question as to who should assume the responsibility of X-ray interpretation.

The interpretation of X-ray plates cannot be left to the various members of the hospital staff. The relationship of the roentgenologist to the staff is the relation of the consultant to the physician. If the roentgenological service is to be of any real value in your hospital you must look upon your roentgenologist as a consultant. If the roentgenologist is of the right type his opinion is just as valuable as the opinion of your attending neurologist. In our hospital we do not send a requisition for an X-ray examination; a consultation is arranged and the patient is referred to the X-ray department for consultation. If a medical roentgenologist is in charge of the X-ray department he should be equipped to do roentgen therapy. That is a procedure of such responsibility that it cannot be left to a technician no matter how well trained.

I am in a position to judge somewhat of the X-ray needs of a hospital in a small community, and I believe we have solved the problem for one hospital in our state near Bridgeport. A hospital of about 100 beds in a community of 25,000 has a competent graduate nurse in charge of the roentgenological service and the films that are taken there are sent to us for interpretation. A roentgenologist can in the course of two or three months train a graduate nurse in the roentgen examination of the gastro-intestinal tract so that she can produce a series of plates following out a standard technique. A movement has now been instituted by the American Roentgenological Society to standardize X-ray reports. A long time ago routine examinations were standardized as to technique, and the standardization of the report and the individual interpretation of it will mean adequate service for the small hospital.

I believe that technicians assuming the responsibility in hospital X-ray service should be examined as to their fitness for the work, be registered, kept within their limitations.

SECTION E—NURSING SERVICE

By Miss MARY BEARD, Boston
Superintendent, Instructive District Visiting Nurses Association

THE report which I will present is a summary of the nursing survey made by the Rockefeller Foundation and includes the nine conclusions to which the committee came.

This study of nursing education originated in January, 1919, when, due to the fact that the Rockefeller Foundation had been appealed to from so many angles to give gifts to support nursing education in one way or another, it decided that it was advisable and really would help the cause to get together about fifty persons concerned in education and discuss the advisability of making a really thorough scientific study of the whole subject of public health nursing, particularly whether anyone other than a graduate nurse could do this work effectively, and if so what preparation that other woman ought to have. It was the pressing need for more nurses in the field of public health that first suggested the desirability of such an investigation.

The committee states that they have attempted to survey the entire field occupied by the nurse and other related workers of this type, to form a test of the qualifications necessary for their education, and on what basis such a function would be sound economically and conform to educational standards, for which there appears to be a vital social need. The persons constituting the committee as it finally got to work —because almost immediately when we began to study the subject of public health nursing we found it necessary to study the subject of nurses—consisted of doctors and hospital superintendents, the latter including nurses and physicians.

The nine conclusions to which the committee came, it seemed to me, you would want to hear, because they take up the really important and controversial points in the question of education. The conclusions are as follows:

"1. That, since constructive health work and health teaching in families is best done by persons (*a*) capable of giving general health instruction, as distinguished from instruction in any one specialty; and (*b*) capable of rendering bedside care at need; the agent responsible for such constructive health work and health teaching in families should have completed the nurses' training. Experts other than nurses, such as nutrition workers, social workers, occupational therapists, etc., should be called on to perform their special functions, in cooperation with the nurse.

"That as soon as may be practicable all agencies, public or private, employing public health nurses, should require as a prerequisite for employment the basic hospital training, followed by a post-graduate course, including both class work and field work, in public health nursing.

"2. That the career open to young women of high capacity, in public health nursing or in hospital supervision and nursing education, is one of the most attractive fields now open, in its promise of professional success and of rewarding public service; and that every effort should be made to attract such young women into this field.

"3. That for the care of persons suffering from serious and acute disease the safety of the patient, and the responsibility of the medical and nursing professions, demand the maintenance of the standards of educational attainment now generally accepted by the best sentiment of both professions and embodied in the legislation of the more progressive states; and that any attempt to lower these standards would be fraught with real danger to the public.

"4. That steps should be taken through state legislation for the definition and licensure of a subsidiary grade of nursing service, the subsidiary type of worker to serve under practicing physicians in the care of mild, chronic, and convalescent illness and possibly to assist under the direction of the trained nurse in certain phases of hospital and visiting nursing.

"5. That, while training schools for nurses have made remarkable progress, and while the best schools of today in many respects reach a high level of educational attainment, the average hospital training school is not organized on such a basis as to conform to the standards accepted in other educational fields; that the instruction in such schools is frequently casual and uncorrelated; that the educational needs and the health and strength of students is frequently sacrificed to practical hospital exigencies; that such shortcomings are primarily due to the lack of independent endow-

ments for nursing education; that existing educational facilities are on the whole inadequate for the preparation of the high grade of nurses required for the care of serious illness and for service in the fields of public health and nursing education; and that the chief reason for the lack of sufficient recruits, of a high type, to meet such needs lies precisely in the fact that the average hospital training school does not offer a sufficiently attractive avenue of entrance to this field.

"6. That, with the necessary financial support, and under a separate board or training school committee, organized primarily for educational purposes, it is possible with completion of a high school course or its equivalent as a prerequisite, to reduce the fundamental period of hospital training to twenty-eight months and at the same time, by eliminating non-educational routine and organizing the course along the intensive and co-ordinated lines laid down in Miss Goldmark's report, to give a sound and practical training, entirely adequate for the preparation of the type of nurse needed for the care of the acutely ill and for the hygienic education of the public; and that courses of this standard would be reasonably certain to attract students in increasing numbers and of high quality."

That is, in twenty-four months with four months added for preliminary training, if we followed Miss Josephine Goldmark's outline of study and made these twenty-eight months really educational, we should provide a graduate nurse who really would have had experience in mental illness, in communicable disease, in pediatrics, and in nutritional study. It was found in one of the very best hospital training schools that we have in this country, that a process went on which was known as milking the floor of the diet kitchen. That was actually a process of rubbing that floor with milk and it took half an hour a day of the nurse's time, the nurse who was fitted to care for the sick. The milk had a tendency to polish the floor, the custom was established many years ago when the milk supply was plentiful, and few people knew that it was being done!

A Vassar training camp student sent to one of these hospitals to complete her training, was made to do that thing. But she did wish she had more opportunity to find out about the care of sick people. And in another hospital, a registered hospital too, the single lecture which the nurses were to have in nutrition was attended by the investigator, and it was found that it was being given by a man who was an advertising agent for a food preparation. He had asked for the privilege of talking to these girls in training about foods and this was the only lecture they had on nutrition. Those instances you will find in Miss Goldmark's report.

In following her recommendations it will be found that the twenty-four months, with four months extra for preliminary training, are to be given to the study of those things which theoretically we have, but actually and practically too often we do not have.

"7. That the development and strengthening of University Schools of Nursing of a high grade is likely, directly and indirectly, to accomplish more for the improvement of nursing education than any other single step which can be taken at the present time.

"8. That when the licensure of a subsidiary grade of nursing service is provided for, the establishment of training courses in preparation for such service is highly desirable; that such courses should be conducted in special hospitals, in small general hospitals or in separate sections of hospitals where nurses are also trained; and that the course should be of eight or nine months' duration.

"9. That the development of nursing service adequate for the care of the sick and for the conduct of the modern public health campaign demands as an absolute prerequisite the securing of funds for the endowment of nursing education of all types; that it is of primary importance, in this connection, to provide reasonably generous endowments for University Schools of Nursing; and that gifts for this purpose, at the present time, are likely to accomplish greater results in the promotion of the health of the people than those which are offered by any other line of community or philanthropic effort."

DISCUSSION

MRS. WILLIAM LOWELL PUTNAM, Boston, Massachusetts: I have been for many years interested in the training of nurses spoken of in the fourth section of the conclusions. I believe, speaking as one of the public, that the nursing needs of the public are not now being taken care of adequately. The very poor and the very rich are cared for but not the large body of people. If they employ a trained nurse the price is now absolutely beyond their means and they descend to the ranks of the poor. For those people, nurses can be provided of a separate grade and I should be very glad—in fact I will ask any of you who will attend the school for which I speak—to welcome you at the Household Nursing Associa-

tion at 222 Newbury Street. We have for a great many years carried on this work and the attendants whom we graduate have been found entirely satisfactory to everyone employing them. They are given the four months' bedside training in the hospital and two months' training in dietetics, including housework because they supply the need of the sick. They do the housework and care not only for the sick in the home but for the home in the sickness, which is very often what a tired and sick mother wants—to avoid getting up to cook an early breakfast and send the children to school, to find these things taken from her, and to see that the children are sent along to school and the husband with his dinner pail.

We work with a very high grade hospital for our training. In the September report for the summer months, there were fifteen of our students trained at the Memorial Hospital in Gardner, three in the Framingham Hospital, thirteen in other hospitals, and fourteen taking training at their home. The price, of course, is very much less and for chronic cases and cases of mild illness, they are absolutely satisfactory. Take, for example, a maternity case, where the woman is delivered in a hospital. She does not require a trained nurse to take home with her to take care of her baby. The trained nurses are not now taught to do many of the necessities of life for the patient of moderate means. They do not like to wash the baby's diapers, or carry up the breakfast tray. And those things are not a part of the trained nurse's training, and it seems to me, if you will excuse me for saying so, that the fault lies with the medical profession. The medical profession undertake, to their glory, to take care of all classes of people, no matter what their means, and there is nobody in the community who does so much for charity. But they have not socialized the training of nurses as they should.

I was consulted the other day by the State Nurses Association, who wanted to bring in a bill to have a supervisor standardize the training of nurses. They do not want a doctor, they want a nurse. Now the nurse and the social worker are the doctor's right hand, and we are taught on high authority: "Let not your right hand know what your left hand doeth." But there is nothing to prevent letting your brain know what both hands doeth.

THE RIGHT OF A HOSPITAL TO APPOINT A STAFF

By A. R. WARNER, M.D., Chicago
Executive Secretary, American Hospital Association

THREE factors have caused the current keen and general interest in the question of the right of a hospital to appoint a staff. The inquiry comes from every group interested in hospital work.

1. *The rapid increase in the number of hospitals appointing a medical staff.* The motives behind the appointment of staffs have been primarily to insure the patients of the institution—particularly the free and part-pay cases—a better medical service. It is done secondarily to secure the continuity and the unity of professional policies necessary to develop teaching and also to create an organization which can properly direct and develop the various aids to the professional work maintained by the hospital (as laboratories, etc.). The arguments advanced and points considered have been confined entirely to the internal operation of the institution. The right and duty of the hospital to do this have not been emphasized and established and are, therefore, questioned by objectors.

2. *The organization of those objecting to the existence of the hospital staff, and concerted action by these objectors.* Several state legislatures have passed bills removing from the classification as charitable institutions (tax free) any hospital not admitting to practice in the institution all licensed practitioners of the state. This included not only the regular graduates in medicine but the medical cults as well. The cults have vigorously protested because the existence of a staff and professional policies and standards in hospitals have kept them out. These bills were all vetoed by the Governors but considerable publicity on the question was secured. Objectors in the regular medical profession have been active. One county medical society of Ohio promptly expelled eight of its members who accepted positions on the newly formed staff of the local hospital.

All objectors have questioned the right of the hospital to choose its agents or, as they have expressed it, "to discriminate."

3. *The clearer establishment of a definite liability of the hospital for its patients.* The word "liability" has an ominous sound: it suggests litigation and damages. Hospitals know that their liability has increased and that supreme courts

are confirming damage awards in some cases. Instead of studying their liability and developing plans to meet it, the hospitals generally have shuddered at the very thought, hoping that such a calamity might never come to them and have feared even more the suggestion of a lawsuit. The reaction of the hospital in this frame of mind to the threat of a local practitioner to sue "for his rights" and "for damages if excluded from the institution" is often so feeble and timid as to be pathetic. Sometimes this is not purely bluff on the part of the local practitioner. He really believes that the funds to build and maintain the hospital were given, primarily, to provide facilities to physicians for their personal use and, secondarily, for the welfare of the patients, instead of, primarily, for the welfare of the patients and, secondarily, to the profession as a whole for its development. Every hospital must know the basis of its appeal for funds—whether for the physicians in the community or for the patients in the institution—and the trust assumed in accepting funds, to carry out this purpose is the only obligation. In this they are fully protected and it is the failure to perform this trust to the letter that creates the liability.

These three factors have not only raised the question as to the right of the hospital to appoint the staff but surrounded it with many complications, irrelevant to be sure, but nevertheless confusing. These can be neglected. By "right" is meant legal right. The question as to the advisability of the staff is not a factor other than indirectly through the establishment of the decision that a staff does or does not better the service rendered to the patients in the hospital. The courts would certainly recognize not only the privilege but the obligation upon the trustees of every hospital to provide every reasonable means in their power to improve the professional service rendered by the institution to its patients. This is the trust they have assumed. But all this depends on the interpretation of the value of the staff to the patients. This is not final—therefore not considered here. The final answer to the question is, of course, to be found in the law itself as finally interpreted by the Supreme Court. Let us consider this.

In the decisions of all courts on questions pertaining to the liability of hospitals, two fundamental principles have always appeared. In a way, these principles are irreconcilable. The first principle invariably considered is the protection of the rights of the individual. There never was any question as to the liability to a person injured by a nuisance created by the hospital on its premises and the question always arises as to why patients should be excepted. The second principle invariably considered is the obligation upon the courts to protect trust funds and to preserve them for the purposes designated by the donor. All hospital funds are trust funds and given substantially for the same purpose, which is for the maintenance of indigent patients in the institution. Dissipation of these funds by the awarding of damages certainly is not protection.

The conflict between these principles has produced in the past a great variation in the court decisions. Every decision has been an attempt to reconcile these two principles. We can omit here all discussion of the many decisions that have contributed to the development of a policy or tendency of the courts to unite on a definite position as a just compromise between these two principles. It is an interesting story but long. The fact only needs to be presented.

A recent decision of the Ohio Supreme Court (No. 16926—Decided January 24, 1922) sets forth this compromise clearer than others have done and states more concisely the guiding principle under which the decision (a unanimous one) was reached. It reads as follows:

"Where a public charitable hospital has failed to exercise due and reasonable care in the selection of physicians, nurses, or attendants and injury results from the incompetence or negligence of such persons, the hospital is liable."

In the development of this compromise came the recognition that trustees are obligated to make every reasonable effort to carry out the provisions of a trust, but no more. The trustees of the hospital and no others are the responsible trustees of funds given to the hospital in trust. A board of trustees cannot and is not competent to supervise every act of every agent of the hospital, but it can "exercise due and reasonable care" in the selection of all agents. To do less than this is to be false to the trust.

Such argument led to the present tendency of the courts to limit the liability of the hospital to the requirement that the responsible trustees shall "exercise due and reasonable care" in the selection of all agents, but after this has been done to absolve the hospital from responsibility for the acts of the agents so chosen.

Conclusion and answer to the question. The responsibility "to exercise due and reasonable care in the selection of physicians, nurses, and attendants" guarantees to the trustees full freedom to make this selection and in their own way. If they choose to announce their choice through an appointment to a staff or by inclusion on a

privileged list or in any other way, they may do so. The effect is the same: They made the selection and are responsible therefor. *A hospital not only has the right to select a staff but is obligated "to exercise due and reasonable care" in the selection. The right to select carries with it the right to reject and for any reason their judgment may dictate.* The trustees carry all the responsibility.

Some who would recognize the right to appoint a staff would question the right of the hospital to refuse a licensed practitioner the privilege to treat a private patient in the institution. All court decisions known to the writer have brushed aside questions as to payments made or the status of the patient in the hospital. All patients in the hospital are pointedly classed alike. It is undoubtedly true that a hotel would find it difficult to exclude any licensed practitioner of medicine from treating any guest of the hotel. It is also likely that a hospital could not legally prevent a licensed practitioner from merely visiting and advising a patient, if this was desired by the patient. Such a situation, if objectionable, necessarily must be handled by the exclusion of the patient rather than the exclusion of the doctor.

But if the hospital grants to any physician the right to direct the work of any employee or attendant of the hospital, it clearly accepts this physician as its agent and is as responsible for him as for a full staff member. As it is quite impossible for a physician to treat a patient in a modern hospital without directing the work of nurses and other attendants of the hospital, the trustees necessarily assume full responsibility "to exercise due and reasonable care" in the selection of this agent when this privilege is granted. Again the responsibility to select carries with it the right to reject.

WORK OF THE HOSPITAL SURVEYOR

By E. MURRAY BLAIR, M.D., Vancouver
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IT seems to me the best method of approaching this subject is for you to go with me on an imaginary hospital visit, call on a hospital, and examine the points which we consider essential in arriving at a conclusion.

At our arrival we find that we are not unexpected and I want to bring out this point at the very beginning. It shows the attitude of the College visitor toward the hospitals; he invariably requests an interview by telephone. The College visitor does not telephone to the hospital and say, "I am coming"; there is no idea of dictation in any of our work at any time; it is suggestion from start to finish. We are there for your own good, we hope, and our suggestions are offered in good faith. If they are of value we want you to receive them; if they are of no value they are automatically dropped.

We ask for the minutes of the staff meetings from which we can glean a great deal. We ascertain the regularity of the meetings, the type of programs held, and the analysis of end-results. We find out, also, from the minutes, or in some other way, whether the staff has gone on record prohibiting the division of fees under any guise whatever. We must look for that and be sure that it is there and lay emphasis on it if it is missing.

During our visit to the wards we examine the current records to see whether they are stereotyped histories of questions answered "yes" or "no," or whether they are really accurate stories of the complaints. We want to know if there are complete physical examinations of all patients, regular progress notes, and accurate operation records.

In looking at the charts we look for a provisional diagnosis. We believe that a provisional diagnosis is important from many standpoints. When a patient is admitted there should be something definite on record to say why he is in the hospital. Another thing about it is that it is a splendid thing for a doctor to be able to go on record, and if he is wrong to *be* wrong. Recently a prominent physician said to me, "I think the most discouraging cases I have to meet are my patients which come to autopsy." We go over on the private side and look at the records in exactly the same way because we believe there should be no difference in the records for the public and the private patients.

An extraordinary thing in hospitals is the extreme lack of laboratory work that is found. Some very able men in this land seem to forget their laboratory work for some reason. In examining the equipment we want to feel that there is at least enough for the simpler experiments and as much more as possible. We want to know about the technician, about her supervision, and about the pathologist; we want to know about the facilities for the tissue work, whether done in the

hospital, and if not, where it is sent. There is no reason why laboratories should not be utilized to a greater extent. When I have talked to technicians about it, they have said, "Certainly, we are wrong; there is more we can do and we will do it." Our hospitals are built around our laboratories; each hospital is a scientific institution because it has a laboratory. The old idea of building a hospital around an operating room has gone. It is our duty to see that our laboratories are exploited as far as possible. The record room of the laboratory, also, is important. We want to feel that it is the headquarters for scientific work. We want to feel that all the work which goes on in the laboratory including the records thereof is well done.

We ask to see the record room where we study the record system, including the alphabetical index, disease index, and filing cabinets. We inquire as to the use made of the card indexes, for there is no use asking hospitals to put in an elaborate system of indexes if they never use them.

We will take 50 records at random, say within the last two or three months, and we will study them carefully, checking the percentage of personal histories, physical examinations, working diagnoses, operation records, progress notes, laboratory findings, and condition on discharge. At the end of our examination of the charts we call the superintendent in and discuss the results, so that there will be no misunderstanding.

The College visitor finds an enormous satisfaction in this work for there is something about it which you cannot find anywhere else. Every problem is a different one. We feel that we are in a work which is worth while. Our examination is based on an economic standpoint. We know that it is a great help wherever it is put into effect and that it is a stimulus to any hospital and to its patients. It undoubtedly affords the community a better place in which to be sick.

A PACKAGE LIBRARY OF SURGICAL LITERATURE

A Loan Service Furnished Without Charge by the Library of the American College of Surgeons

THE Library and Department of Literary Research of the American College of Surgeons has undertaken the compilation of a package library, material from which will be loaned, without charge, for research work on surgical subjects. This package library is a practical means of bringing the library service of the College directly to the Fellows wherever they may be, and of serving especially those who are located far from any medical and surgical library.

The collection contains reprints and articles clipped from medical and surgical journals classified for ready reference. With the hearty co-operation of the Fellows the Department began the accumulation of this material over a year ago and contributions are still being received. The grouping and classifying, however, have been in progress for little more than four months. In this short time, loan material has gone out in connection with the research work of the Department on thirty different subjects such as: treatment of fractures, arthroplasty of all joints, fractures of the patella, megacolon, and pyelitis. In twelve instances, requests for information were answered entirely by a selection of material from the package library.

As the collection grows it will become more and more useful. When requests are received by the Department of Literary Research only a few days in advance of the surgeon's need for the material and there is little time for compiling bibliographies and abstracting articles, reference is made to the package library, material from which can be selected and mailed without delay. Only a very incomplete service can be furnished in this way, however. More often the package library material will supplement the work of abstracting and translating. A number of original articles with full description of technique, charts, and illustrations add materially to the information given in the abstracts. The selected articles are easily carried in a convenient package and will be read by the physician when he would not have the time to do the same amount of reading in a library from the bound journals.

The articles from the package library are loaned for a period of two weeks and the time is frequently extended upon request. The prompt return of the material is, of course, essential if the collection is to be maintained. This is especially true now while the collection is small considering the demands made upon it.

Every Fellow of the College is asked to furnish the Department with two copies of the reprints of his articles. One copy is placed in a collection of the works of the Fellows, and this file should be made complete and held intact as a permanent record. The other copy is placed in the loan library.

In addition to this material in the package library a number of surgeons have contributed their collections of reprints and unbound files of leading surgical journals for the clipping service. The Department is always glad to have the co-operation of the Fellows in this connection and would greatly appreciate it if any surgeon would send in a list of odd numbers or more complete files of the journals he would be willing to contribute for this purpose. The Department can then select material not already in the file and notify him of the need for a part or all of his offering.

Through this brief announcement of the package library service, the Department of Literary Research asks the continued co-operation of the Fellows to furnish articles which should be in the permanent collection and in the package library, and invites them to send in their requests for research work which can be supplied in part at least by this free loan service.

IN MEMORIAM

Stephen Smith
1823–1922

DR. STEPHEN SMITH, Honorary Fellow of the American College of Surgeons, died on Saturday, August 26, 1922, at the home of his daughter, Mrs. Walter S. Mason, Montour Falls, New York, aged 99 years, 6 months, and 8 days. He was the oldest member of the College and unquestionably the oldest American surgeon or physician, who had attained like fame and distinction in a career marked by many notable achievements. Dr. Smith was born at Spafford, Onandago Co., New York, on February 19, 1823, and graduated from the College of Physicians and Surgeons, New York City in 1851. His mother lived to be 97, and his sister, Miss Mary Smith, died at the age of 100 years and 1 month. In 1849, before his graduation he served as medical interne at the Sisters of Charity Hospital, Buffalo, New York, during an epidemic of Asiatic cholera, and contracted a mild attack of the disease himself. In 1850 he was a member of the resident staff of Bellevue Hospital, and 1854 a Visiting Surgeon to Bellevue, serving until 1864, when he was appointed surgeon to St. Vincent's Hospital, and in 1890 to the Columbus Hospital.

In the Civil War he served as Volunteer Surgeon at Fortress Monroe and Fredericksburg. Later he was a member of the committees which drew plans for the Roosevelt Hospital, New York City, and for the Johns Hopkins Hospital of Baltimore. He was a lecturer at Bellevue Hospital Medical College until 1874, when he became professor of clinical surgery in the University Medical College, New York.

He was the author of the handbook entitled *Principles and Practice of Surgery* which was supplied to every regular and volunteer surgeon at the beginning of the Civil War. This book was later published by the Southern Confederacy anonymously and was also supplied to their surgeons.

In 1851 he began his work in sanitation and was the chief author of the Sanitary Code which was adopted as a State Law in 1866. This, the first effective public health law, is perhaps the greatest monument to his memory. He was the founder of the American Public Health Association, and its first president in 1872, being subsequently re-elected three times. In 1878 he started the work of forming a National Board of Health, and in 1882 drew up a law which established a State Board of Health in New York State. In 1894 he was appointed by President Cleveland one of three United States delegates to the International Sanitary Conference at Paris.

In 1881 he was appointed one of the commissioners of the State Board of Charities and in 1892 State Commissioner in Lunacy, being reappointed several times to both offices.

On November 16, 1921, the American Public Health Association gave a remarkable banquet in his honor at the Hotel Astor, New York City. Dr. William H. Welch acted as toastmaster. Dr. Smith, then nearly 99 years old, read a paper which he had written for the occasion, on "A Half Century of Public Health," and he stood throughout the entire speech.

His death closes a career of remarkable achievement, especially in the field of Public Health. He is survived by a son, three daughters and six grandchildren.

Charles H. Peck.